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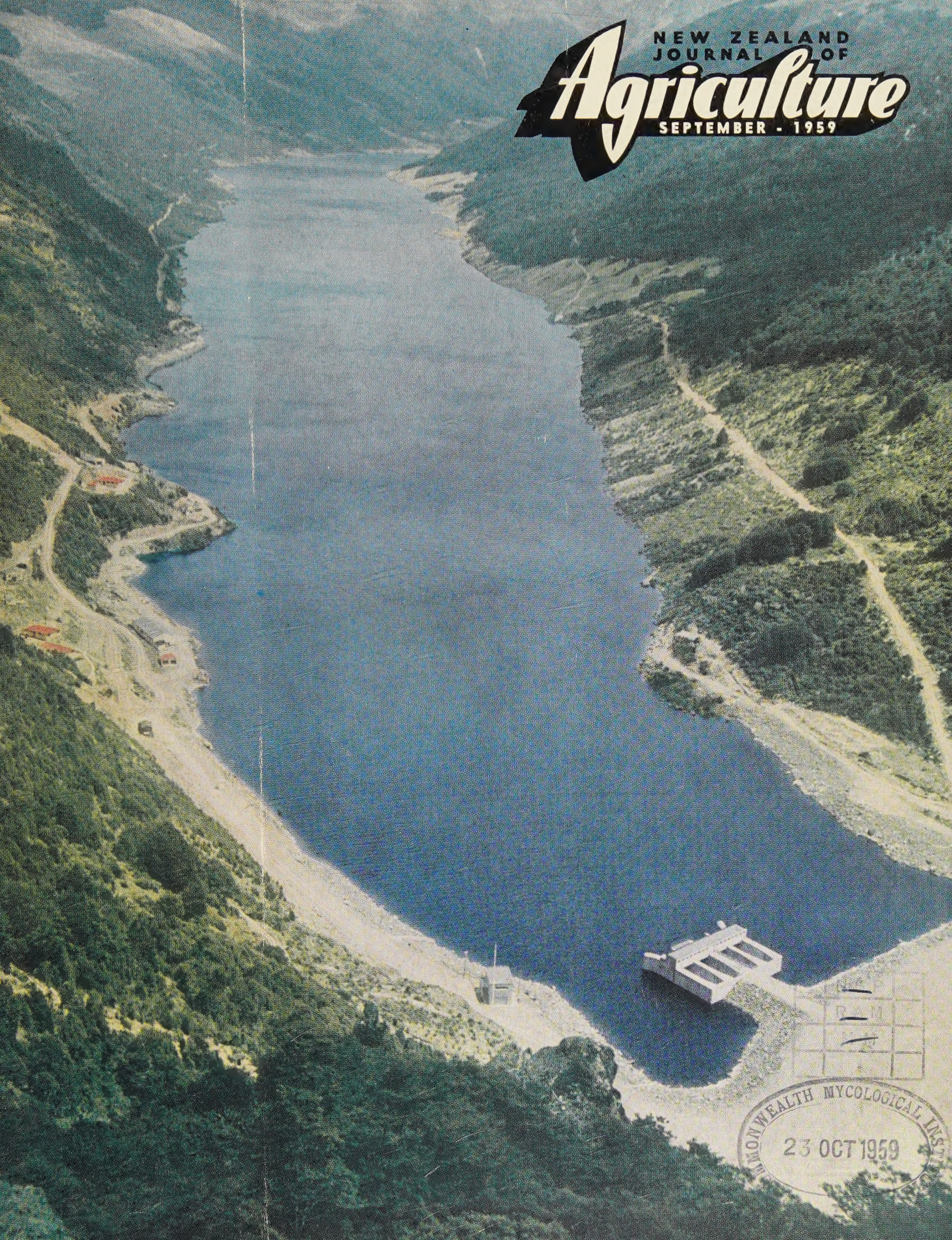

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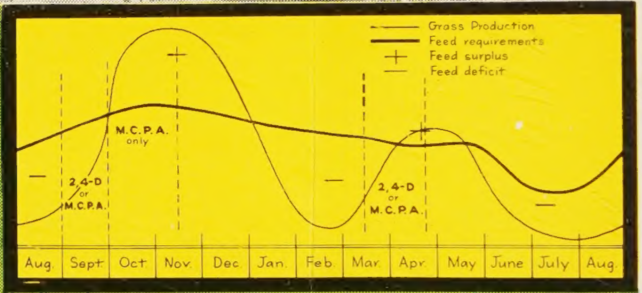

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The lake behind the Cobb Valley dam is shown on our cover. It was reproduced from a photograph taken from a similar position to that used for the July 1955 cover. A comparison of the two views tells more clearly than any words how the dam and lake were developed (see page 203).

[*N.Z. Forest Service photo by J. H. Johns*

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Inheritance ?

The Relationship of Inheritance and Environment to Herd Production

By P. J. BRUMBY, Senior Animal Geneticist, Ruakura
Animal Research Station, Hamilton

WORK at Ruakura Animal Research Station on the effects of inheritance and environment on dairy herd production has attracted widespread attention for some years. It involved the drawing of two calves from each of 20 high- and 20 low-producing farm herds and their milking as one herd at Ruakura, with return to their owners after their first lactation at Ruakura. In a coordinated second experiment 40 sets of identical twin calves from Ruakura were divided each year for three years between the same 20 high- and 20 low-producing farms from which the calves in the first experiment were drawn. After their first lactation on farms they were returned to Ruakura.

Conclusions drawn from these studies (see panel on opposite page) were presented in a paper to the Ruakura Farmers' Conference in June. Field studies of management factors on the high- and low-producing farms in an endeavour to find and explain the non-genetic factors that were of major importance in differences between the two groups were discussed in a second paper. Adaptations of the two papers follow.

IF you, as individual farmers, were asked "What has been the most important advance in dairy cattle breeding during the last 50 years?" I am sure your unanimous answer would be A.I., or A.B. as it is more delicately, but less accurately, called. The effect of A.I. in dairy cattle breeding can be summed up in three short statements:

1 It has short circuited the social hierarchy of the New Zealand Jersey cow.

2 It has been a major instrument in improving production per cow in New Zealand.

3 It has provided the key data with which the murky tangle of production figures cluttering every farm, A.I. office, and research station has been clarified. Let me briefly amplify these comments.

Environment?

THE analyses that have been made of the movement of breeding stock from farm to farm in New Zealand show that New Zealand cattle fit into a neat social structure. At the top of that social pyramid are a group of about 100 dominant breeders who maintain fairly closed herds or who, more usually, buy bulls from another member of this top group. This group sell bulls to the second tier of breeders, who in effect simply multiply this stock and who in turn sell bulls to the small pedigree breeder. It is this last group who hope to sell into the grade herds of the country.

The consequences of this social system are twofold.

Firstly, it is easy to see that the genetic differences that may at any time exist between the different levels are continually being ironed out by the interchange of breeding stock.

Secondly, it is also easy to see that any long-term changes in the genetic make-up of a breed are determined entirely by the operations of the dominant group of breeders. Any culling in the lower herds produces no long-term improvement, because its effects are constantly being diluted by the blood of the next bull bought in.

Conclusions

CONCLUSIONS from results of experiments, with the results of the earlier work described, are clear cut. We can sum them up as follows:

1. The differences in milk yield that occur between herds are mainly due to management, not breeding. About half the differences in butterfat test that occur between herds are likely to be genetic. About 10 per cent of the differences in butterfat yield between herds are likely to be genetic.

2. Though genetic differences between herds in milk and fat yield are small, there are sufficient differences between individual animals in their breeding value for these characters for appreciable improvement to be made in them by breeding.

3. Because of the small genetic differences between herds, superior breeding animals for milk and fat yield are likely to be found in the upper-producing bracket of animals in any herd irrespective of that herd's level of production.

The original idea underlying A.I. in New Zealand was a very simple one: to find the best bulls in the country and use them as widely as possible by this new technique. Like most people those responsible for A.I. thought the best bulls were to be found in the top-producing and elite herds of the country. Consequently many bulls purchased for A.I. originated in these herds, with the result that the A.I. movement cut across or short circuited the conventional social ladder of pedigree cattle.

Once the bulls from the elite herds had large numbers of daughters in production in many commercial herds, two most valuable pieces of information were obtained.

Firstly, it quickly became apparent that there were consistent differences in any one herd between daughter groups by different bulls, indicating clearly that genetic differences among different sires could be used to advantage in breeding better cattle.

Figures were then obtained concerning the size of the differences that might reasonably be expected between the daughter groups of different bulls; we knew just how often a good bull was likely to be found and how often a poor one was

Dr P. J. Brumby.

to be expected. More important still we discovered the extent to which the superiority of the breeding animal was reflected in his progeny; in other words we were able to measure the inheritance or the heritability of different characters.

Table 1 gives a general idea of the differences that commonly occur in any one herd between large daughter groups by different bulls:

TABLE 1—COMMON DIFFERENCES IN ONE HERD BETWEEN DIFFERENT LARGE DAUGHTER GROUPS BY DIFFERENT BULLS

Character	Difference between daughter groups
Fat yield	20 lb
Fat test	0.15 per cent
S.N.F. test	0.10 per cent
Weight	20 lb
Fertility (C.R. 1st service)	2 per cent

These differences between different daughter groups have been worked out in such a way that one bull in six will lift the character by more than half the difference shown. On average, then, we expect that one bull of every six bred in New Zealand would leave daughters averaging more than 10 lb better than their herd contemporaries; that one in six would drop production by more than 10 lb; and that the remaining four would lie between these extremes and be neither particularly good nor bad. These figures also tell us that about one bull of every 50 bred will lift production by more than 20 lb of fat. You can readily see that the chances of finding many Lamorna Minors are rather slight.

The second important point that emerged from the A.B. data was that the bulls bought from the top elite herds did not appear to be leaving daughters much better in production than bulls from the other two tiers of pedigree breeders. This observation suggested the rather heretical conclusion that genetic differences between the three pedigree groups and the grade herds were rather small.

This point involved far more than a source of argument between research people and pedigree breeders; the really important problem was to design the New Zealand sire survey system in such a way that it might identify, with the greatest possible accuracy, the outstanding bulls in New Zealand.

An example might make this problem clear. If all the differences in production between a 200 and a 400 lb herd are due to breeding, we should take all our industry bulls from the 400 lb herds. On the other hand, if all this difference was due to feeding and management, the chances of a good bull being bred in either group are roughly equal, and we are then much more concerned with the difference between the average of a bull's daughters and their herd mates, as an indication of breeding merit, rather than with the overall level of production. In practice the situation hardly seemed to be a case of either all genetic or all environmental. Rather it seemed likely that part of the differences was environmental and part genetic; the big question was how much of each?

▼ Cattle from both the high- and low-producing farms being run as one herd at Ruakura.

We discussed this matter at some length at Ruakura with many interested bodies, particularly the Dairy Board, and eventually decided to tackle the problem in two related experiments.

In the first experiment we took two young calves, a week or so of age, from each of 20 high-producing herds, many of which were pedigree herds, and likewise two calves from each of 20 low-producing herds. These calves were from average cows in each herd and by the major herd sire. This occurred each year for three successive years.

These young calves were then reared as one mob and eventually milked as one herd at Ruakura. After their first lactation at Ruakura they were then returned to their owners and subsequent lactations recorded.

In the second experiment we divided some 40 sets of identical twin calves each year for three years between the same 20 high- and 20 low-producing farms. These young twin calves were reared and milked along with the farmers' own young stock. After the end of the first lactation of these twins about half of them were returned to Ruakura and subsequently milked under uniform feeding and milking conditions.

Before considering the results of these experiments it is, I think, worth while to look at the performance records of these 20 high- and 20 low-producing herds.

Table 2 summarises the mean production records for these farms over the seven years preceding the experiment.

TABLE 2—LACTATION RECORDS OF PARENT HERDS

	Milk	Test	Fat	Days
		Two-year-olds		
High ..	5,702	5.43	309	275
Low ..	3,603	4.96	178	227
		Three-year-olds		
High ..	6,372	5.50	350	276
Low ..	4,015	5.00	201	226
		Mature		
High ..	7,382	5.40	399	277
Low ..	4,737	4.88	231	231

There are three main points in this table. They are:

1. A greater increase to maturity in the high herds compared with the low.

2. A marked difference in fat test.

3. A marked difference in lactation length.

When we analysed the average calving dates we found that both the two-year-olds and mature cows in the high herds calved about one week earlier than those in the low herds. Age composition studies indicated that there were a greater number of aged cows (10 years and over) in the high herds. These high herds also had a much greater stability of replacement rate and age composition.

So much, then, for the brief background data on the parent herds.

Table 3 shows the body weight data for the calves taken from these herds to Ruakura. No real differences in weight were apparent at any time.

TABLE 3—GROWTH DATA

	Lb liveweight					
	1954 calves		1955 calves		1956 calves	
	Low	High	Low	High	Low	High
6 weeks ..	78	79	80	82	86	83
12 months	366	357	366	362	393	394
23 months	715	689	684	684	712	717
34 months	778	754	780	787		

Of the 240 calves collected we have managed to calve down about 70 each year for the last three years, wastage being fairly evenly divided between the two groups with the usual causes occurring in about the same numbers in each group.

The production figures for the first two crops of heifers are indicated in Tables 4 and 5.

TABLE 4—TWO-YEAR-OLD PRODUCTIONS 1956-7 SEASON

	Milk	Test	Fat	Days
		Ruakura		
High ..	6,396	5.25	334	301
Low ..	6,356	5.11	321	301
	40 (1.7 per cent)	0.14 (47 per cent)	13 (10.1 per cent)	0 (0 per cent)
		Farmers' two-year-old		
High ..	6,139	5.39	331	287
Low ..	3,833	5.09	195	235
	2,306	0.30	136	52

TABLE 5—TWO-YEAR-OLD PRODUCTIONS 1957-8 SEASON

	Milk	Test	Fat	Days
		Ruakura		
High ..	5,986	5.77	348	296
Low ..	6,139	5.52	337	298
	—153 (—8.9 per cent)	0.25 (62 per cent)	11 (9.4 per cent)	—2 (—8.7 per cent)
		Farmers' two-year-old		
High ..	6,134	5.59	342	285
Low ..	4,424	5.18	228	260
	1,710	0.41	114	25

It is, I think, clear that the only difference of any consequence that we observed in the two groups at Ruakura was in the fat test. Approximately half the difference in test observed in the actual high and low farm productions was reproduced at Ruakura. This genetic difference in test gave rise to a small difference in butterfat yield in favour of the high cattle, amounting to some 10 per cent of the actual field difference.

Of these 70 heifers milked each season at Ruakura some 50 were returned to their owners at the end of their first lactation. Of these 44 completed normal second lactations. A summary of these production figures is shown in Table 6.

TABLE 6—SUMMARY OF PRODUCTION FIGURES

	Milk	Test	Fat	Days
Two-year-old production when at Ruakura				
High ..	6,442	5.29	340	300
Low ..	6,424	5.12	326	303
Three-year-old production in parent herds				
High ..	6,686	5.38	361	273
Low ..	4,709	5.09	239	251
Contemporary three-year-old in parent herds				
High ..	6,780	5.25	374	268
Low ..	5,068	5.07	256	249

Two points worth attention are the large drop in production when the low herd heifers returned to the parent herd, plus the fact that in both the high and low groups their contemporary three-year-olds apparently outproduced them. It appears, then, that their first three years of life at Ruakura have not had any permanent influence on their productive ability.

Let us now consider the twin data.

At about 12 months of age the twins on the farms were measured and weighed. Table 7 indicates the distribution of chest girth measurements among the twins in the high and low herds.

TABLE 7—CHEST GIRTH OF TWINS AT 12 MONTHS

Chest girth (cm)	1954		1955		1956	
	Low	High	Low	High	Low	High
100-109 ..	4	—	1	—	—	—
110-119 ..	14	10	4	5	3	1
120-129 ..	12	19	19	21	8	10
130-139 ..	3	6	14	13	19	21
140-149 ..	2	—	2	1	6	4
Average weight difference ..	40 lb		35 lb		10 lb	

Again there are two points worth notice. The first is the rather small difference in average size between the yearlings on the high and low farms. The second is the greater distribution of size in the yearlings on the low farms, some being very good and some very poor. The fact that yearlings in some of the low farms are bigger than those on any of the high farms is fair evidence that on some of the low farms poor feeding is not likely to be a big factor causing low productions.

The production figures for the first two groups of these animals are listed in Tables 8 and 9.

TABLE 8—TWIN PRODUCTIONS 1956-7 SEASON

	Milk	Test	Fat	Days
		Twins		
High ..	5,541	5.18	288	276
Low ..	3,574	5.03	181	217
	1,967 (101 per cent)	.15 (47 per cent)	107 (91 per cent)	59 (116 per cent)
		Farmers' two-year-old		
High ..	5,959	5.41	322	287
Low ..	4,013	5.09	205	236
	1,946	.32	117	51

TABLE 9—TWIN PRODUCTIONS 1957-8 SEASON

	Milk	Test	Fat	Days
		Twins		
High ..	5,930	5.25	312	280
Low ..	4,153	5.07	210	251
	1,777 (97 per cent)	.18 (37 per cent)	102 (84 per cent)	29 (94 per cent)
		Farmers' two-year-old		
High ..	6,069	5.60	339	284
Low ..	4,243	5.11	217	253
	1,826	.49	122	31

As in the first part of the experiment it is apparent that the only appreciable genetic difference observed between the two groups of herds was in the fat test. Here approximately half the actual difference in test between the two groups appeared to be genetic in origin. This difference in test gave rise to a small genetic difference in butterfat yield, amounting to about 10 per cent of the total difference.

Table 10 shows the average productions of the twins returned to Ruakura and milked under uniform conditions as three-year-olds.

TABLE 10—THREE-YEAR-OLD PRODUCTIONS AT RUAKURA

	Milk	Test	Fat	100-day lactations av. wt. difference
		1957-8: 10 pair		
Ex high ..	2,706	5.13	138.6	25 lb
Ex low ..	2,841	4.98	140.6	
		1958-9: 8 pair		
Ex high ..	2,813	4.99	139	10 lb
Ex low ..	2,715	4.97	134	

These twins have shown a somewhat greater variability than is usual for uniformly reared twins, but the overall production of the two groups is comparable. On average, then, the productive level of the herd in which an animal is reared and milked appears to have little permanent influence on that animal's subsequent production figures.

Summarising the results of both experiments, it is, I think, fair to say that there is good general agreement among the results, indicating that the differences in milk yield between the herds in these experiments were almost solely determined by environmental causes, that roughly one half of the differences that occurred in fat test were due to genetic differences, and that about 10 per cent of the differences in fat yield were genetic in origin.

Acknowledgment

Thanks are extended to all those who made these experiments possible. They were stimulated largely by the work of J. Hancock, who also contributed to their eventual design. They have been possible only by the generous cooperation of the 40 participating farmers. A large technical and farm staff have been involved in day-to-day operations of the five years. The Auckland Herd Improvement Association helped materially on the organising side and the Superintendent, Ruakura, assisted with constructive criticism.

Management of High- and Low-producing Herds

By J. D. J. SCOTT, Extension Officer, and D. S. M. PHILLIPS, Research Officer, both of Ruakura Animal Research Station, Hamilton

FROM the results obtained in the experiment described in the previous article it is quite clear that genetic differences accounted for only a small proportion of the production differences between the two groups of herds involved and that non-genetic factors were of major importance.

BECAUSE there is such a large range of non-genetic factors which could have been responsible and because it is of considerable interest and importance to identify the principal one or ones concerned, details have been collected about the herds themselves and the environmental conditions under which they have been maintained. A description of these conditions and an explanation of the apparent reasons for the marked differences in production between the two groups follow.

← J. D. J. Scott.

Description of Farms

Most of the farms concerned are located throughout the Waikato area from Tokoroa and Otorohanga in the south to Patetonga and Hikutaia in the north, while a small number are at Waihi and Rotorua. In most cases both high and low herds are situated in each district concerned, so that the overall climatic conditions are reasonably similar for both groups.

Table 1 shows the average effective area and carrying capacity for both groups.

TABLE 1—AREA AND CARRYING CAPACITY OF FARMS

	Size acres	Cows	Young stock wintered per cent	Cows per 100 acres	No. grazing-off or with run-off
High	124	88	28	71	7
Low	120	74	23	62	3

Based on 18 high and 19 low farms. One 400-acre sheep and dairy cattle low farm excluded.

Points here are the similar average size of 124 and 120 acres and the higher carrying capacity of the high farms. This is counterbalanced, probably to a major extent, by the more widespread use of run-offs and the grazing-off of dry stock from a number of these high farms. The figures for the number of young stock wintered, expressed as a percentage of the number of cows on each farm, refer to the total number of yearlings wintered and not to the replacements entering the herds. The percentage of young stock carried is higher on the high farms, because in this group there are a greater number of pedigree breeders and these carry extra stock for sale.

In general the high farms are of easier contour and better sheltered than the low.

TABLE 2—CONTOUR AND SHELTER OF FARMS

	Hilly	Gently rolling	Flat	Well sheltered	Moderate shelter	Little shelter
High	1	8	10	11	6	1
Low	5	6	9	5	5	10

Though there are no accurate measurements to support the representation in Table 2, it is a fair summary of conditions. By a hilly farm is meant one with only a small portion mowable and by gently rolling one in which the bulk can be mown. A well sheltered farm is one with the majority of paddocks protected by hedges or tree plantations. Points are the much greater number of low farms classed as hilly and the better shelter on the high farms. Of the nine low farms classed as flat six are on peat or swampy areas.

Normal topdressing over recent years has been 3¾ cwt of superphosphate and ½ cwt of potash per acre per year on the high farms and 3 cwt of superphosphate and less than 1·5 cwt of potash on the low. Lime has been applied on five of the high farms and six of the low.

Production

Table 3 shows the approximate production per cow of all normal cows and of normal two-year-olds and the production per acre for both groups.

TABLE 3—PRODUCTION PER COW AND PER ACRE

	Herd average lb butterfat	Two-year-olds lb butterfat	Butterfat per acre
High	390	315	277
Low	240	190	149
Difference ..	150	125	128

During the last five years the total number of cows carried has increased by 15 per cent on the high farms and 7 per cent on the low. Because of this and because the present carrying capacity is higher on the high farms, I do not think that the production per cow on the low farms has been depressed unduly in comparison with the high group by the adoption of a high carrying capacity policy.

At the two-year-old stage the difference in production due to non-genetic causes can be seen from Table 4, which shows the average butterfat productions of the twins on both groups of farms during the past three seasons:

TABLE 4—BUTTERFAT PRODUCTION OF TWINS

	Twins on farms
High	304
Low	204
Difference	100

The difference of 100 lb of butterfat between the identical twins on the two groups of farms is solely due to non-genetic causes.

This non-genetic difference of 100 lb of butterfat at the two-year-old stage has resulted from a lowered milk yield and fat percentage and a shorter lactation.

Management Investigation

From the beginning of this experiment details have been collected by a number of people of the environmental conditions under which the two groups have been maintained, and the most noticeable feature of these investigations has been that no one common factor could be pinpointed as the cause of the difference in production between the two groups. Because of this a systematic investigation embracing important aspects of production has been carried out on all farms and particular emphasis has been placed on three factors: the level of nutrition, the standard of milking, and the incidence of disease. Each of these has been shown, by work at Ruakura, to have a marked bearing on the level of production.

Three related matters help to explain why such a difference in production has occurred. These are age of farmer, length of tenure, and labour supply.

Table 5 shows the position regarding age and length of tenure for the two groups of farmers.

TABLE 5—AGE AND LENGTH OF TENURE OF FARMERS

	Age	Present manager farming since 1950	Present manager farming since war	Property under same management since before war
High	49	3*	8	16
Low	40	9†	14‡	7

* All sons taking over; † 3 sons taking over; ‡ 6 ex-servicemen.

The ages given are an estimate only, but unless high production farming hastens the appearances of age, the estimate should not be far wrong.

It is not suggested that one has to be close to 50 years of age to farm on a high plane, but the facts given help in understanding why production is superior on the high farms. Because of the difference in age and length of tenure the high farmers have had greater time and opportunity to develop their properties to a state suitable for high production.

The third matter is that of labour for farm work. Table 6 shows that the high farms are better supplied with labour than the low.

TABLE 6—LABOUR FOR FARM WORK

	No. of cows	No. labour units	Cows per labour unit	Output butterfat per labour unit lb
High ..	88	1.8	48	18,720
Low ..	76	1.3	59	14,160

Because of the greater supply of labour more time could be spent caring for the needs of the stock on the high farms. As well as this the work of the low farmers is increased in that seven of them keep pigs, whereas they are kept by only two high farmers.

The difference in output per labour unit between the two groups is much smaller on a percentage basis than the difference in output per cow because of the greater number of cows handled per labour unit by the low farmers.

Level of Nutrition

When a systematic attempt was being made to establish the actual reasons for the difference in production attention was first directed to the levels of nutrition under which the herds were maintained, because so many experimental trials have shown that the level of production varies to a greater or less degree according to the level of nutrition imposed. Where extremes have been compared differences in production of over 100 lb of butterfat per cow have been established, and on a number of occasions where more moderate levels have been compared differences of about 60 lb fat per cow have occurred.

The level of nutrition for each herd was assessed in two ways; by measuring and weighing the twins on each farm at different ages and by grading all the cows on all farms according to their condition during a ten-day period in mid October of last year. As well as this the amounts of supplementary feed, such as hay, silage, and crops, fed to each herd during two seasons were recorded.

Grading the cows according to condition involved examining each cow visually and allotting it a figure from one to five, where one represented emaciated and five very fat. While this method could give rise to considerable errors because of the reliance on eye judgment, the results obtained agreed reasonably well with the weight and chest girth measurements which had been taken by other workers and were highly repeatable in instances where two recordings were made within a few days of each other.

This grading was carried out in mid October, at which time differences in condition between cattle which have been well and poorly fed during the previous winter can usually be clearly seen. Fig. 1 illustrates this fact.

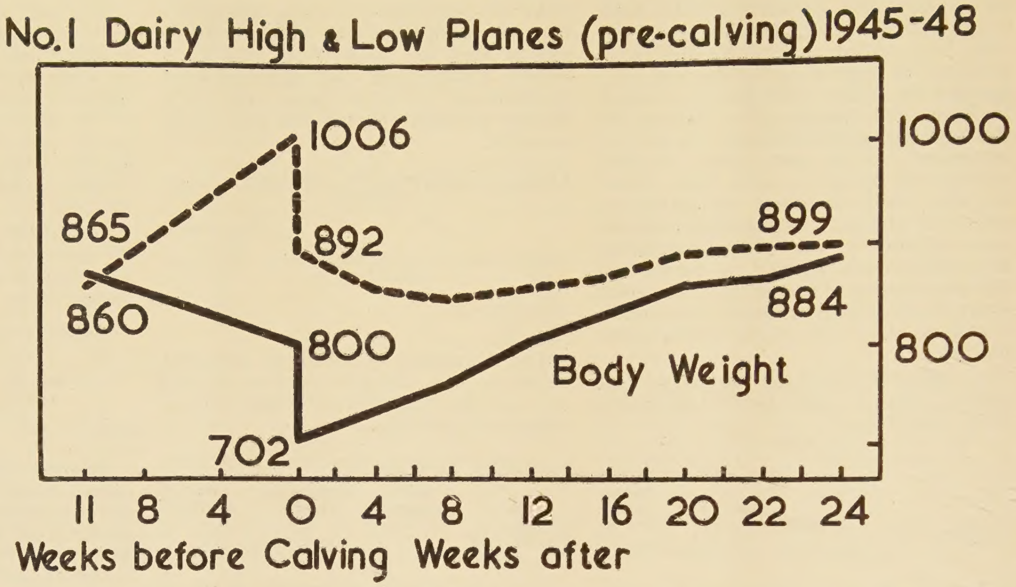


Fig. I.

In this trial Dr Wallace fed groups of cattle at two distinct levels and by calving they differed markedly in condition. After calving they were run together and fed as much as they could eat, but despite this and despite the fact that the high plane group lost weight after calving, there were still pronounced weight and condition differences the following October. In practice cattle which are underfed and low in condition before calving are very often on short rations after calving as well, and differences in condition between them, and cattle well fed both before and after calving, are even more marked.

A difficulty can arise in distinguishing merely by visual appraisal in October between cattle which have been moderately underfed in the winter and others which have been well fed but which have stripped off condition after calving as good cows do. However, by examining the amount of feed available then and the amount of supplementary feed fed to the herd during winter, as well as the condition of the cattle, I think a reasonable estimate can be made of the level of winter nutrition.

Table 7 shows the average amount of supplementary feed each group was fed per year.

TABLE 7—SUPPLEMENTARY FEED (18 HIGH FARMS AND 19 LOW)

	Autumn-saved pasture per cent farms	Area per cow	Hay per cow bales	Silage per cow	No. with summer crop or silage	No. with winter crops	No. feeding concentrates	No. grazing-off or with run-offs
High ..	46	.7	15	.3	15	7	2	7
Low ..	33	.5	16	.1	11	9	3	3

From this it can be seen that the high farmers provided appreciably more autumn-saved pasture and silage and more of them made provision for a summer dry spell. The extra silage would amount to almost a ton per cow. The amount of concentrates fed on the five farms concerned was relatively small, being about 3 tons per farm on the low farms and 7 tons per farm on the high.

Weight and Condition

The preceding article shows that in 1954, 1955, and 1956 the yearlings differed on average by 29 lb liveweight per year.

While these figures show that in general the standard of rearing on both groups of farms was relatively similar, I think it is difficult to relate them to productive performance, because the level of feeding from the yearling stage onward has a much larger impact on production during first lactation than the level up to the yearling stage. It was noted, for instance, that on some low farms the calves were well reared, but the cows underfed.

Therefore, I think a better assessment of the effect of the level of nutrition on production can be obtained from the weights of the two-year-olds and the gradings of their condition.

Fig. 2 shows the general relation between condition and production in the low herds. This is based on grading for condition last October and production of two-year-olds this season just passed. There is a highly significant relationship between the two. In general, as the level of condition increased so did production. Incidentally, I made no inquiries as to the production level of each herd before making these gradings.

Table 8 shows the distribution of herds according to their grading for condition.

TABLE 8—DISTRIBUTION OF HERDS ACCORDING TO GRADING FOR CONDITION

	1.7	2.0-2.3	2.4-2.6	2.6-2.8	2.8-3.0	3.0-3.2
High	—	—	—	9	7	2
Low	2	6	4	3	2	3

The figures show that the low herds in general were lighter in condition than the high. Two were extremely thin and another six just a little better. I think it is most probable that production in all these herds has been penalised quite severely through undernutrition. Another four herds appeared to be moderately underfed, while a further four, though in similar condition to many high herds, had apparently experienced a short period of underfeeding. On four low farms the level of winter feeding was of similar standard to that on most of the high farms. One of these farms, however, is located on hilly country which dries out severely and in most years a summer feeding problem has been experienced.

Standard of Milking

Because these observations on the levels of nutrition for the two groups do not provide an explanation in the case of all farms for the difference in production and because work at Ruakura has clearly shown that the milking technique used can have a marked effect on production, a study was made of the milking methods on all farms in the experiment.

This consisted of attending a complete afternoon milking at each of the farms during October, November, and early December and revisiting about half of them in February and March. Recordings of the time spent on each operation in the shed were made with the aid of a special recording machine designed by D. S. M. Phillips. Before discussing these results I should like to mention briefly a few other interesting factors connected with milking. Some of these are shown in Table 9.

TABLE 9—FACTORS CONNECTED WITH MILKING (BASED ON 18 HIGH FARMS AND 20 LOW)

	No. using leg-ropes	No. examining milk	No. with single bails	No. with double bails	No. with both	No. with muddy approaches to cowshed
High	6	14	6	10	2	7
Low	12	14	5	10	5	16

Almost half of the total number used leg-ropes and just over a quarter did not examine the milk before putting the cups on. The other interesting and possibly quite significant point illustrated in the table is the large number of low farms with muddy approaches to the sheds. There did not, however, at the time of the spring visits, appear to be much difference in the incidence of sores on teats between the two groups of farms.

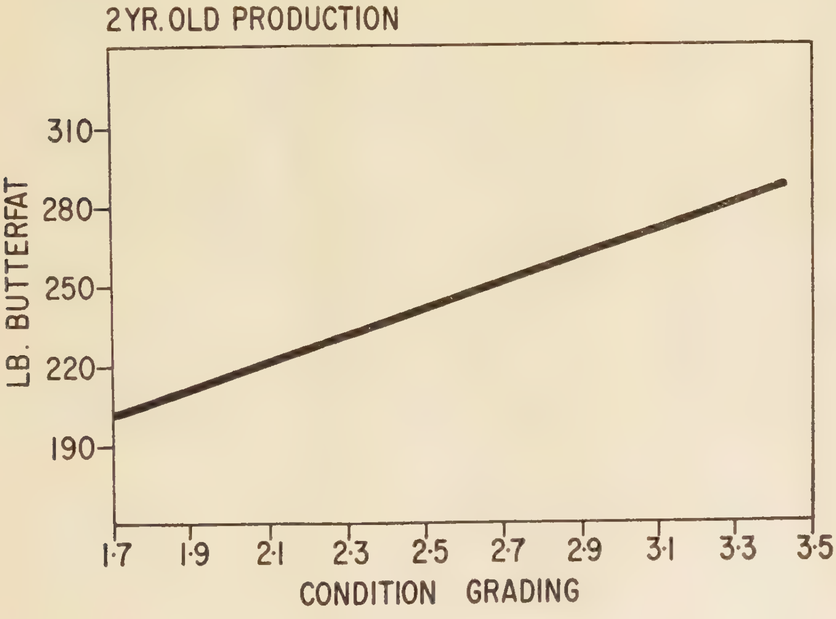


Fig. 2.

TABLE 10—LABOUR UNITS AND SHED OUTPUT

	Cows	Labour units	Sets cups	Time milking hr. min.	Cows per labour unit	Sets cups labour unit	Cows per hour	Cows per labour unit per 1 hour	Cows per set cups 1 hour
High ..	87	2.2	6.8	1 34	39	3.1	54	26	9.7
Low ..	75	1.8	6.6	1 28	43	4.0	50	29	7.9

Table 10 shows the labour complement and output through the sheds. The figure for the cows per labour unit differs from that given earlier for farm work, because extra family labour was used in a number of sheds. Wives milked in four high sheds and eight low. Points in this table are the greater supply of labour on the high farms and the quicker turnover of cows on the low. This quicker turnover, as will be seen soon, was achieved in part by spending less time washing and stripping. The variation in output of cows per labour unit per hour was very great. On the high farms it varied from 14 to 37 and on the low from 19 to 47.

Table 11 shows the average results obtained for the two groups during the spring recordings.

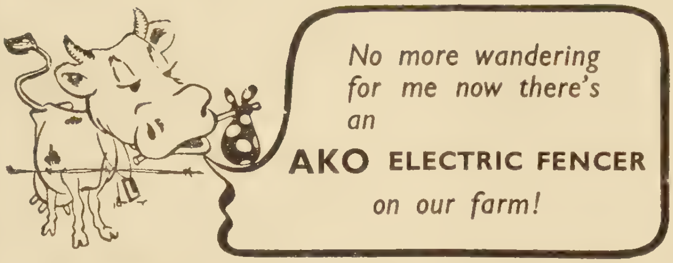
The figures given are the average of the recordings for all the farms in each group. The average wash and hand start per cow on the high farms was 25 seconds and 18 seconds on the low farms. Figures for wash, hand start, delay start wash—cups on, machine stripping, and hand stripping apply to all the cows handled by one milker in each shed and those for delay start wash—milk flow, cups on, milk flow, and delay cease flow—cups off to all the cows which went through one bail in each shed. In an eight-aside herringbone shed these individual recordings were therefore made on approximately 16 per cent of all cows and in a two doubled-up shed on approximately 25 per cent of all cows.

TABLE 11—AVERAGE RESULTS DURING SPRING RECORDINGS

	Wash sec.	Hand start sec.	Delay start wash—cups on min.sec.	Delay start wash—milk flow min.sec.	Cups on min.sec.	Milk flow min.sec.	Delay cease flow—cups off min.sec.	Mach. strip sec.	Hand strip sec.	No. using wts.
High ..	22	4	1 8	1 12	5 40	3 25	1 56	22	15	2
Low ..	17	—	1 4	1 28	6 8	3 18	2 26	17	1	7

In general there appeared to be a different approach to milking by the high farmers and some of the low. Almost every high farmer realised the importance of milking and performed the task thoroughly according to his own standards even if these standards did vary. Many of the low farmers did likewise, but a few apparently treated it like any other farm job and seemingly attached little significance to it. Examples of this were the non-use of sight glasses on one farm and most irregular times of milking on others. While these two matters in themselves may not be of great importance, I believe they do serve as examples of the difference in approach.

The figures show the difference in the thoroughness with which milking was carried out by the two groups. The high farmers spent distinctly longer stimulating and stripping their cattle than the low. The difference in the time spent on these operations, particularly on stimulating, is also probably one of the reasons for the difference in production between the groups in view of the work at Ruakura on that subject by Mr Phillips and Dr Whittlestone.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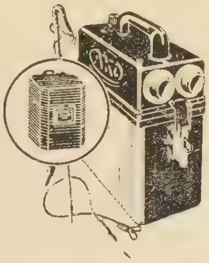

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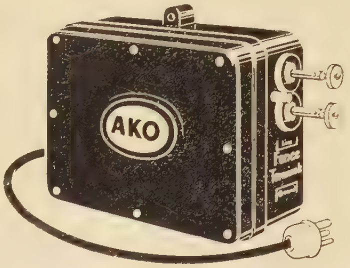

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The difference in the time the cups were on reflects the fact that the low farmers were handling more cups than the high and the difference in the time of milk flow that the cows on the high farms were producing more milk than those on the low.

The end point of milk flow was difficult to determine accurately, because on all but one of the farms jam jar sight glasses were used. The point decided on was the one at which I thought machine stripping should start. In most cases the time spent machine stripping is included in the period "Delay cease flow—cups off".

To appreciate the effect of the milking methods used on production I think it is best to consider particular characteristics in turn.

Stimulation

Table 12 shows the numbers falling into different classes according to the length of time spent washing.

TABLE 12—LENGTH OF TIME SPENT WASHING

	3 to 10 sec.	11 to 20 sec.	21 to 30 sec.	Over 30 sec.	Average per cow
High ..	3	5	6	4	25
Low ..	5	10	2	3	18

Of the three high farmers washing for less than 10 seconds one varied his time and left all cows until they had let down their milk before putting on the cups. Another hand stripped all cows and this may possibly have compensated for the short washing time of seven seconds. The other had had very variable production and this may, in part, be due to lack of stimulation. There is also the possibility that cattle which require little stimulation have been bred on these farms.

On three of the five low farms with washes of 10 seconds or less, the washing time was relatively uniform for all cows and no attention was paid to individual cows. I think it is most likely that production has been depressed through lack of stimulation on these farms. Two of these were farms with a high level of nutrition. On the fourth, though the wash was on average short, at 9 seconds per cow, the farmer waited for a short time to see that each cow let down her milk before putting on the cups. Because of this and because this man was a very careful stockman I would hesitate to suggest that much production was lost on this farm through short washing. On the fifth of these short-wash farms the farmer noted that one-fifth of his cows were not milking properly and these after normal milking were hand started and machine milked again. His loss in production would probably also be small.

There is little data to indicate how moderate washing, say for 11 to 20 seconds, compares with pronounced washing and stimulation. The effect could even be different at different planes of nutrition. In other words,

ELECTRICITY—CONTROL OF WATER FLOW—FOREST PRESERVATION

[*N.Z Forest Service photos by J. H. Johns*

Three needs, electricity generation, water conservation and stabilisation of run-off, and preservation of native protection forest, are all served by the Cobb River dam development in Nelson. These two illustrations (reproduced in colour on "Journal" covers in July 1955 and for this issue respectively) show how the river behind the dam has been converted into a lake ringed by native forest consisting mainly of silver and mountain beech. Preservation of native forest, alpine shrubs, and grasses in the catchment area to check erosion is a feature of the Cobb development. The hydro-electric station has a capacity of 32,200 kW.

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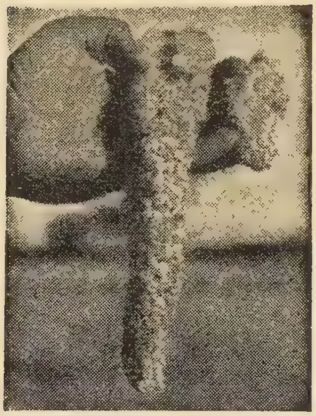

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it is quite possible that moderate stimulation could be reasonably satisfactory under good feeding conditions, but inadequate under poor conditions. However, I believe that on the farms where moderate washing has been practised the loss in production has not been great because the majority of the farmers concerned were observant men who varied their preparation time to some extent according to whether a cow was letting down her milk and milking out properly and who would in the course of time cull cows which required more stimulation than they were providing. Of the five high farmers with a moderate wash two hand started all cows all seasons and another two hand started a proportion of cows.

Delay before Cups on

Table 13 gives the division of farmers according to their delay between the start of washing and putting on the cups.

TABLE 13—DELAY BETWEEN START OF WASHING AND PUTTING ON CUPS

	Average	Less than 1 min.	1 to 1½ min.	1½ to 2 min.	Over 2 min.
High	1 min. 6 sec.	9	5	2	2
Low	1 min. 4 sec.	10	9	—	1

A trial by Dr Whittlestone and further work by Mr Phillips suggest that if the delay between the start of washing and putting on the cups is two minutes or more over the flush part of the season the production of many cows is depressed. It is quite likely that the type of cow affected is the type which is also affected by lack of stimulation.

In the high group production has fallen considerably on one of two farms which has a delay of over two minutes. This is probably partly due to the milking method used, but is also due in part to an outbreak of infertility. On the other high farm with a long delay production this year is relatively low at 350 lb of fat per cow. Though this may be due to the milking methods used, I feel that there may be another explanation, as a number of the older cows which have produced very well in the past have done poorly this year. Perhaps an outbreak of facial eczema about four years ago has been responsible. I think it is quite likely that a strain of cattle which need little stimulation and which can stand a delay after washing have been bred on this farm, for it is a pedigree herd which has used an A.I. sire known to leave free milking daughters.

In the low group on the one farm with a lengthy delay production is relatively low despite a high level of nutrition and despite the fact that the stock are very quietly handled and the farmer is most observant and careful with them. I think it is most likely that his production would increase with a better technique. On two other low farms using both single and double bails the cows were washed as soon as they entered a bail irrespective of whether they were in a single or double bail. Table 14 shows the delay from the start of wash to cups on for both farms and both types of bail. These recordings were made during the February visit.

TABLE 14—DELAY FROM START OF WASH TO CUPS ON AND TYPES OF BAIL

	Farm 1	Farm 2
Singles ..	5 min. 50 sec.	5 min. 34 sec.
Doubles ..	18	23

Both these farmers were short wash exponents and because of this and because of the lengthy delay imposed on some of their cows it is most likely that on both these farms production was lost in the shed.

In a herringbone shed where all the cows in one row were washed as soon as they entered the shed the delay in February between washing and putting on the cups varied between 1 minute 48 seconds for the first cow washed and over 4 minutes for the last. This, too, could have resulted in lower production.

Stripping

Our knowledge of the effect of machine stripping on production is limited, but in a British experiment production was decreased by about 10 per cent in cattle which had the cups removed once the sight glass cleared and in which no attempt was made to drain out the milk left in the cistern of the udder. Again there is probably much variation between cows in their need for stripping.

Table 15 shows the stripping practices on the two groups of farms.

TABLE 15—STRIPPING PRACTICES BASED ON 18 HIGH FARMS AND 20 LOW

	No. hand stripping	No. with pronounced m.s.	No. with little m.s.	No. not stripping
High ..	8	8	1	1
Low ..	1	10	6	3

Pronounced machine stripping in this case is where the cups have been pressed down for 25 seconds or more per cow or where weights have been used extensively.

As you can see almost half the high farmers took no chances and hand stripped all or most of the cows in their herds. The number of low farmers not stripping or performing very little is quite high and this could have had a rather small depressing effect on production.

Stockmanship

The way in which stock are handled is obviously most important to production, but one of the difficulties in a survey of this kind is that people who are rough with cattle are most likely to behave differently when someone is watching than when they are on their own. However, on two low farms while I was present the patience of a milker was insufficient to last until I had left, and the cows concerned were given a sharp reminder to behave better. On one other low farm and one high I strongly suspected similar occurrences.

Unfortunately there does not appear to be any easy or precise way to measure the extent to which cows are at ease with their milkers and surroundings, but at the same time while watching each of these farmers milk, I could not help forming an opinion on the ability of each in handling stock and on whether the cattle were contented or not. The opinion on the ability to handle stock was based on each farmer's attitude to his stock, his patience and reaction to upsetting influences, his observancy, and the methods he used in coping with fractious cows. That on the extent to which the cows were contented was formed by observing how easily the cows entered the bails and how they reacted to washing and cup application.

The degree of contentment of the cows is, I believe, the important criterion in this matter and in Table 16 I have listed the number of farmers in each group according to whether I considered their cattle at ease or not.

TABLE 16—CONTENTMENT OF CATTLE

	Cattle contented	Cattle ill-at-ease
High	17	1
Low	15	4

It is impossible to estimate the loss in production through poor handling, though in extreme cases it could undoubtedly be severe. However, in these particular farms despite the displays of impatience seen and suspected I do not believe the treatments overall were severe, and loss in production may have been largely confined to the naturally nervous cows.

Incidence of Disease

It was difficult to obtain accurate information on the incidence of disease on the two groups of farms, because few accurate records had been collected.

On the low farms during the last three years there was one serious outbreak of infertility and one of mastitis. On the high farms during the same period another outbreak of infertility occurred.

Apart from these there appeared to be little difference in the incidence of disease between the two groups. However, different types of disease, particularly of the metabolic group, appeared to occur more commonly on one group than the other. For instance, milk fever and bloat were frequently experienced on the high farms and acidosis on the low.

It was also interesting to record that at least one-third of the high farmers experienced a severe outbreak of facial eczema in their herds in either 1955 or 1956.

Mastitis could have achieved a firmer hold before detection on more of the low farms than the high, because a greater number of low farmers failed to examine the milk of their cows before applying the cups.

From the information which I was able to collect it appears unlikely that differences in the incidence of disease have been a major reason for differences in the level of production between the two groups, unless disease outbreaks affect production more severely at one plane of nutrition than another. I do think that this is possible. For instance, an attack of foot rot could have a much more serious effect on a cow which is in poor condition and on sparse feed than on one in high condition on ample pasture.

Lactation Strength

As mentioned earlier, the difference in butterfat production between the twins on the two groups of farms resulted from a difference in milk yield, fat percentage, and length of lactation. The difference in each of these characteristics could result from either poor feeding or poor milking. The shorter lactation of the low cattle has also been due in part to the earlier cessation of milking. With a greater supply of labour none of the high farmers had to terminate milking in order to obtain a holiday, and as all were keen to obtain maximum butterfat yields, the cattle were kept milking as long as possible. This situation did not apply on all low farms. Some farmers terminated milking to take a holiday during the May school holidays.

Summary

Table 17 indicates the relative importance of under-nutrition and poor milking according to my estimates in this sample of low herds.

TABLE 17—UNDER-NUTRITION AND POOR MILKING

	Poor nutrition	Poor milking	Poor milking and nutrition
Number ..	12	3	3
Loss in production	105	81	115

In Table 17 the low herds listed under poor nutrition are the ones where the milking methods used were apparently adequate and were similar to those used on most of the high farms but where the level of nutrition was lower. The herds listed under poor milking are those where the level of nutrition has been similar to that of the high herds, but where the milking methods used have differed. The remainder are those which have differed in both feeding and milking this season. The loss in production has been calculated by subtracting the production figures achieved by the 2-year-olds on each group of farms from the level attained by the 2-year-olds on the high farms after allowing for differences in genetic merit.

It is clear from this table that most of loss in production has occurred on the farms with a low level of nutrition. If there is no interaction between milking methods and the level of nutrition, under-nutrition, in this sample of farms, would appear to be the greatest single cause of loss.

Other Aspects

I have confined my remarks to possible causes of the difference in production between the two-year-old twins. This difference is smaller than the difference between the mature cows in both groups. There are several reasons for this. The first is that two-year-olds mature to about the same extent on a proportionate basis, but because they are initially at two levels of production, the difference becomes wider at maturity.

Another reason is the difference in age composition of the herds. The cattle in the low herds are younger and therefore there is a higher proportion of lower-producing immature cattle among them.

One of the reasons for the difference in age composition is that the high farmers retain a much higher proportion of their empty cows than the low. These cows are either carried over milking, in which case they usually produce as well or better than a two-year-old, or are dried off and given a year's rest. Dairy Board figures indicate that their subsequent production is appreciably higher, by 40 lb of butterfat or so, than during normal lactation. On the low farms empty cows reach such a low level of production by the end of the first season that they are not worth carrying over empty and endanger feed supplies if carried over dry.

The effect of the "testing error" is also greater at a high level of production and the true difference may not be as great as the apparent.

Conclusion

Despite the explanations given I hope I have not conveyed the impression that I consider all of the discrepancy in production has been accounted for satisfactorily. I have already suggested two possible sources of error about which we know little, those of interactions between the plane of nutrition and milking methods and disease. There are also a number of other reasons why the explanations given could well be incomplete. One is that the farms were not visited often enough; that we were insufficiently acute in our observations to notice the true causes of the difference in production. Another is lack of appreciation of the true value and effect of stockmanship, milking routines, and milking machines. The effect on production of other aspects noted is also unknown, for instance that of excessive mud and the occasional rounding-up of cows with a backing dog, which not only backed successfully, but which hung on with its teeth.

In the future it will no doubt be possible to provide a much more complete and accurate answer to the type of problem posed by this experiment.

Acknowledgment

John Cowan, Helen Lewis, and Dr Brumby collected much of the information in this survey and Mrs Ulgee did most of the work in preparing it for presentation.

Thanks are expressed to farmers for allowing various measurements to be taken. In this paper the term low is used to describe one group of farmers, but on many of the farms this was not due to the lack of farming ability of the owner.

Control of Nodding Thistle

THE nodding thistle, *Carduus nutans*, may be easily killed in the small rosette or seedling stages by most hormone weedkillers, but as it gets more mature it becomes increasingly hard to kill. Thistles striking in late autumn or early spring can be killed by spraying now or next month with 2,4-D, MCPA, 2,4-DB, or MCPB at ½ lb acid equivalent per acre. This light rate of 2,4-D or MCPA does little harm to established clovers while giving a quick, complete kill of small nodding thistles. MCPB or 2,4-DB should be used on young clover; they are slower than MCPA or 2,4-D in killing thistles, but their kill is just as complete. Thistles over 6 in. in diameter need higher rates, and in some cases more than 1 lb acid equivalent per acre is required.

Seedling Thistles in Lucerne

Seedling thistles in lucerne stands in spring are most economically controlled by shutting up the stand for hay. The least damaging hormone weedkiller to use on lucerne is 2,4-DB; ½ lb acid equivalent per acre applied in spring gives good control of seedling nodding thistles with little effect on the lucerne, particularly if it has been defoliated. The early autumn striking seedlings may be controlled by late autumn or early spring spraying with light rates of 2,4-DB, provided the thistles are sprayed while still small.

—*E. DELAHUNTY,*
Instructor in Agriculture,
Department of Agriculture,
Ashburton

Fertility Problems of Marginal Areas of the South Island

THE outstandingly successful use of sulphur, molybdenum, lime, phosphate, and inoculation of clovers in the improvement of marginal lands of the South Island has attracted widespread interest. Fertility has been raised over many thousands of acres and carrying capacity increased, with consequent marked improvement in production. Information on deficiencies over a wide range of soils and conditions and on the treatments required to attain responses that have led to such a successful outcome was gleaned from a large number of trials, each containing small plots, established by about 30 officers of the Department of Agriculture. This work was described in a paper to the 1958 conference of the New Zealand Grassland Association by W. R. Lobb, Superintendent, Department of Agriculture's Winchmore Irrigation Research Station, Ashburton, who was closely associated with the carrying out and direction of it. An adaptation of his paper follows.

A lime and molybdenum trial on Monterey Station, Hindon. The initiative of Mr E. M. Lake, of Monterey Station, was a driving force behind much of the experimental work in early development of the tussock grasslands in the Hindon area.

THE frontiers of grassland improvement have moved from the plains and downs to the hills and mountains, from the small paddock to the range, from the accessible to the remote and this has been assisted by many factors not the least of which is the aeroplane. Only about one-third of Canterbury is so-called improved grassland and the position in Otago is similar. It is not so much this one-third that will be discussed, though a considerable portion of it has similar problems, but the two-thirds of unimproved lands, on the plains, downs, and foothills of Canterbury, North Otago, and Marlborough. A fair portion of this can be brought to high production by a study of the problems to be mentioned.

The unimproved areas which have demonstrable potential are not all foothills, mountains, or plains. There are numerous areas of each. Only in comparatively recent times has any real interest in the development of these areas been shown by runholders and research workers or have they been considered of importance. This is equally true of foothill and dry plains areas.

It is perhaps surprising that fundamentally the chief means of improving this country are much the same as those used for 30 to 40 years on the so-called heavy, fertile, developed areas: simply the use of fertilisers and legumes.

Soil Deficiencies Revealed

Impetus to improvement on these areas was given by the Department of Agriculture after a close study of fertiliser and lime effects. These aimed at reducing the costs of improving marginal land for which prospects

Practical Achievements from Applying Field Trial Results

HERE are some examples of what has been achieved by applying practices discussed in this article:

- A 1,000-acre property which in 1951 carried just under 1,000 sheep (750 ewes) and 20 cows by 1956 carried 1,400 ewes, 1,050 dry sheep, and the same number of cattle.
- A 2,500-acre, low-altitude tussock run in 1952 carried 2,000 sheep and 30 cattle. After six years sheep have been increased by 1,200, cattle by 220, and wool production by 15,800 lb or 2.5 lb per head. The wool clip has been doubled. Lambing has risen 15 per cent. There is no cultivable land on this run.
- On an 8,000-acre property, of which approximately 4,000 acres of the lower country has been seeded and topdressed, sheep have increased from 3,680 to 4,860 and cattle from a few to 154. Wool has increased by 7,300 lb or 1½ lb per head.
- On a 4,370-acre run with land ranging from 1,300 to 4,100 ft above sea level and only 220 acres ploughed topdressing of native tussock was started in 1951 and to date 1,020 acres have been fertilised and seeded. Topdressings including sulphur were used for the first time in 1957. The improvement in stocking is shown by the following figures:

	1950	**1958**	**1959**
Ewes	1,300	2,020	2,300
Dry sheep	500	800	750
Total	1,800	2,820	3,050
Cattle		154	200

The lambing percentage has increased from 80 per cent to 110 per cent. In 1950, 500 store lambs but no fats were sold; in 1958, 1,260 fat lambs but no stores were sold. Wool increased from 40 bales in 1950 to 76 bales in 1958, and, very important, the annual death rate, which was 8 per cent in 1950, dropped to 3 per cent in 1958.

* * *

On all the runs quoted, which stretch through Otago and South and North Canterbury, the health and quality of stock and the cover and vigour of the introduced and native plants of the topdressed tussock swards have improved very markedly.

became much brighter after recognition of deficiencies of molybdenum and later of sulphur.

Molybdenum was first used on the foothill country between Outram and Hindon. Development in this area had already begun, based on the use of heavy applications of lime and superphosphate coupled with cultivation. A critical examination of the methods being used has now led to practices in which lime use has been modified to a hitherto unbelievable degree, to a study of phosphate responses, and to rejection of the belief that cultivation is essential to establish clover. It has become necessary to study clover inoculation problems, and these investigations may open up very great possibilities for much greater development.

As a result of trials carried out by the Extension Division of the Department of Agriculture in the northern part of Otago sulphur deficiency was found to limit production over wide areas. These trials also assisted to introduce aerial oversowing and to prove that winter was a suitable—not seemingly absurd—time to sow clover seed in a completely unprepared seedbed.

Measured purely in terms of potential ability to produce, many of the unimproved areas could be highly productive, a fact that is not sufficiently realised. Much of the unimproved tussock grasslands intermingled with the browntop and danthonia country has a coverage of plants which carry between one sheep to five or more acres and one sheep per acre. In all these areas all the stock are underfed all the time. By the introduction of clovers and by correcting fertility a 25-fold increase in measured production has been obtained in some experiments. This would put the potential of some of these areas at 4 to 5 sheep per acre instead of 4 to 5 acres per sheep. To claim this for most of the area may be absurd, but very substantial improvement in both nutritional levels (reflected in wool weights, lambing percentages, and decreased losses) and carrying capacity is possible over a large part of it.

Most of the information on the main fertility problems of the marginal areas considered in this article has been gained from small plot trials conducted by the Department of Agriculture over the past 10 years. The author rates the work on sulphur as of greatest significance, followed in order of importance by that on phosphate, molybdenum, lime, and inoculation.

Sulphur

The first comprehensive studies of sulphur deficiencies in North Otago were carried out in 1952. Sulphur has now been shown to be of importance over a very wide area from Marlborough to Southland. It is no exaggeration to say that some 10 to 15 million acres of the South Island are sulphur deficient.

Within the area described sulphur deficiency does not appear to be associated with soil type, soil-fertility level, district, altitude or topography, or with acid or clay soils. In the South Island at least sulphur deficiency may occur on any soil type.

Sulphur deficiency occurs on the coastal stony soils of North Otago, South and Mid Canterbury, on the heavy coastal soils of North Otago, Canterbury, and Marlborough, and on the high-rainfall plains, terraces, and hills east of the Southern Alps in Otago, Canterbury, and Marlborough.

It may be equally important on areas with rainfall of less than 20 in. and those with rainfall of more than 60 in.; it occurs on both very acid (below pH 5) and alkaline (over pH 7) soils; it is prevalent on limestone soils and greywacke gravels.

As yet there is no information on what factors influence this deficiency. However, there are some very important fundamental aspects of sulphur deficiency on which some reasonable speculation can be made.

The soil-sulphur cycle, like that for nitrogen, may well depend on the organic material and could be influenced by soil organisms, stocking rates, and the manner in which it is possible to build up and turn over organic matter. The influence of low rainfall, leaching, and soil acidity is important. For instance, there are many soils of high fertility in North and Central Otago and in North Canterbury which receive low rainfall and which are sulphur deficient. Frequently these do not have deficiencies of other elements, but generally they are low in organic matter, and means of building it up, both by plant and animal returns, are limited.

On the other hand sulphur-deficient soils in the high-rainfall areas are leached, often have accompanying deficiencies of other elements, tend to be acid, and appear to have low bacterial activity for the breakdown of organic matter.

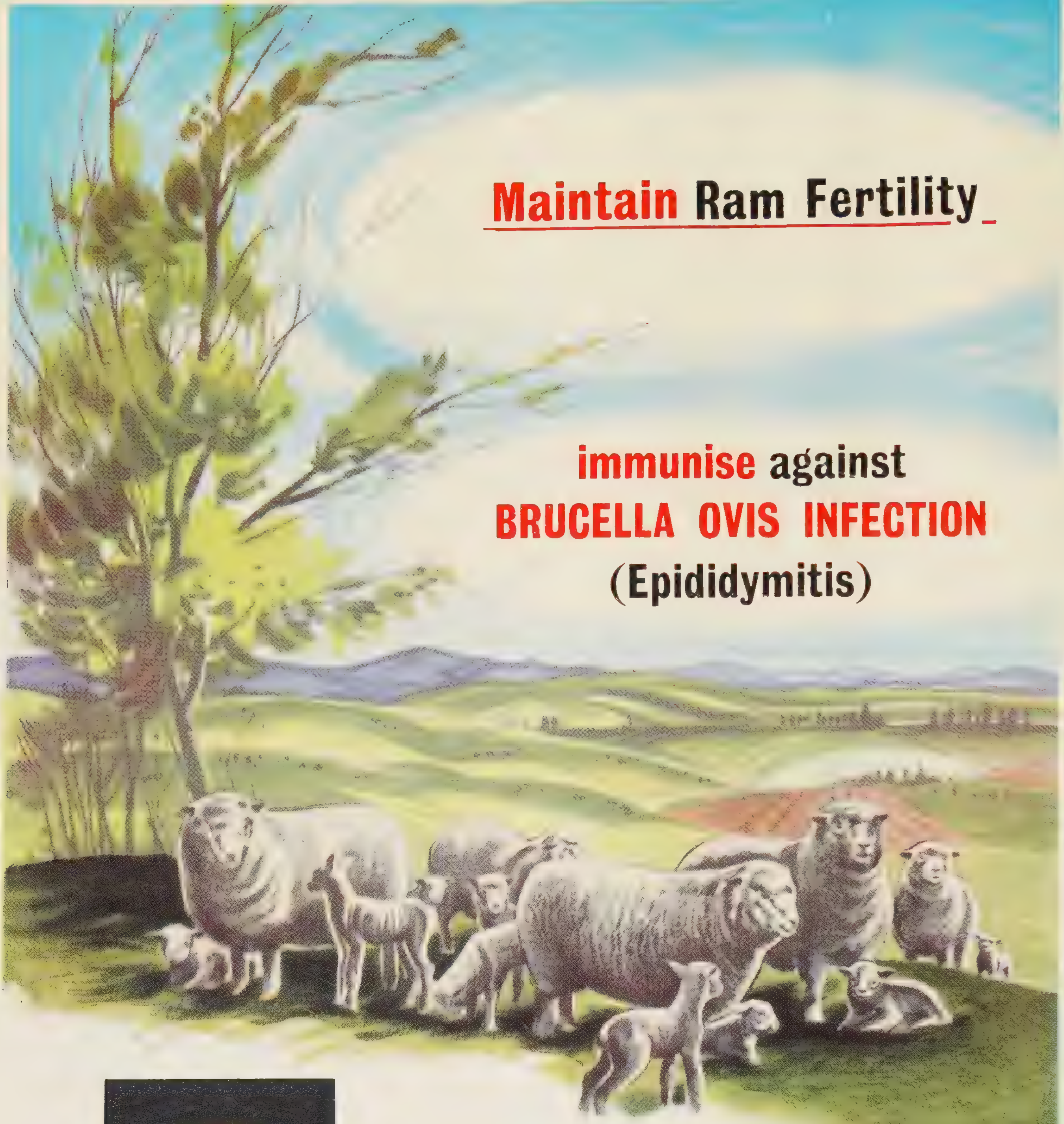
There are many stages between the two categories. It is not uncommon

CORRECTION OF SOIL DEFICIENCIES ON MARGINAL AREAS OF THE SOUTH ISLAND

Marginal areas throughout the South Island carry less than a sheep to the acre, some only one sheep to five acres or more. Only about a third of the farmed area of the South Island is improved pastures.

The problem common to nearly all this country is to get clovers to grow by correcting soil deficiencies.

The chief means of improving marginal areas are fundamentally the same as those employed on developed country: the use of fertilisers and clovers. That climate is not always a limiting factor is shown by the high-producing sward of this 20 in. rainfall downlands area in North Otago.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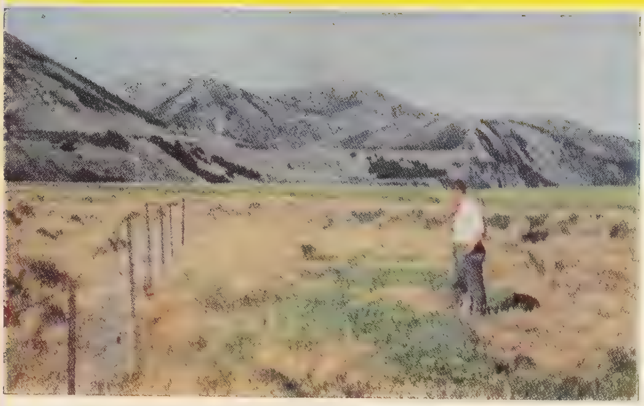
SULPHUR DEFICIENCY OCCURS:

Under High Rainfall

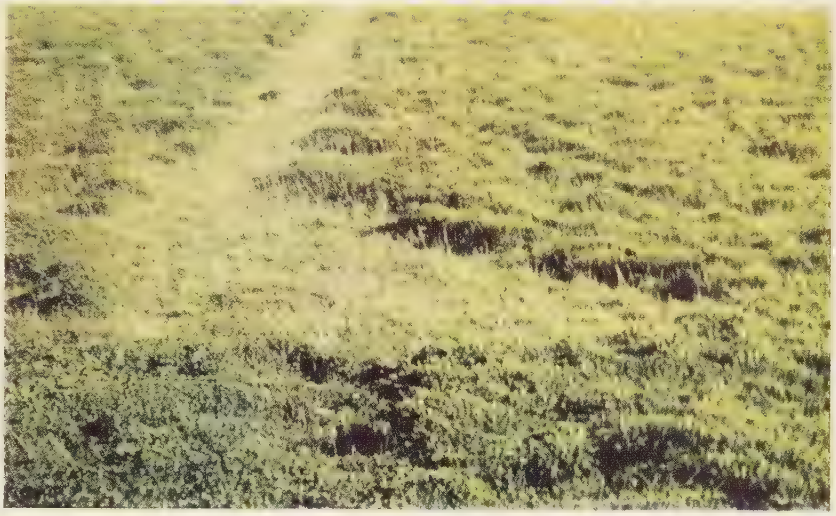


As on this 60 in. rainfall area in the Lewis Pass. It occurs at high altitudes, on inland areas, and on very acid soils.

Under Low Rainfall

As on this coastal country at Glenavy, South Canterbury. It occurs on limestone soils and light gravels.

SULPHUR DEFICIENCY IS WIDESPREAD



It occurs in Marlborough (as shown here by the response to a dressing of 90 lb per acre of gypsum); it occurs on the hillsides of Central Otago.

EFFECTIVENESS OF VARIOUS FORMS OF SULPHUR

Under low rainfall gypsum (right) can be more effective than sulphur in obtaining clover establishment.

Under high rainfall sulphur might be more effective than gypsum.

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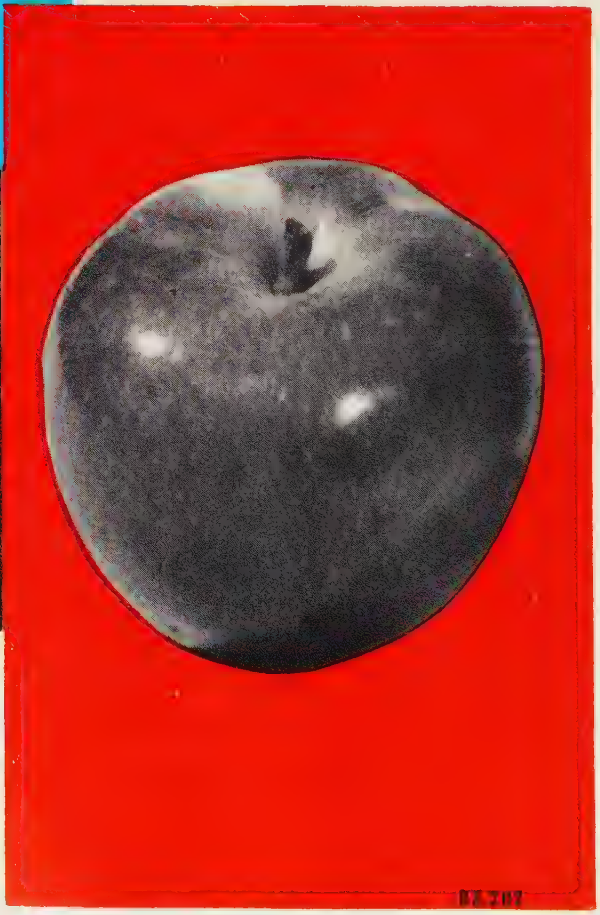

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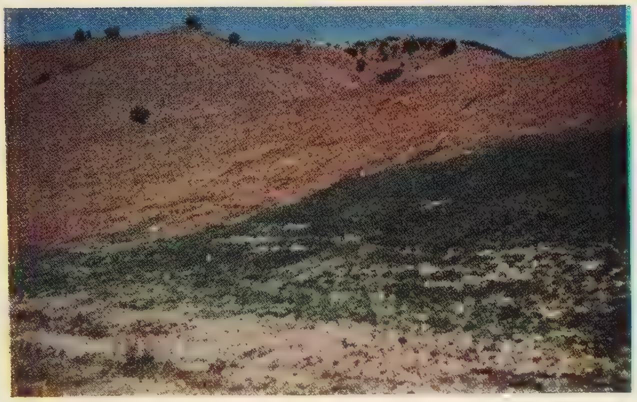
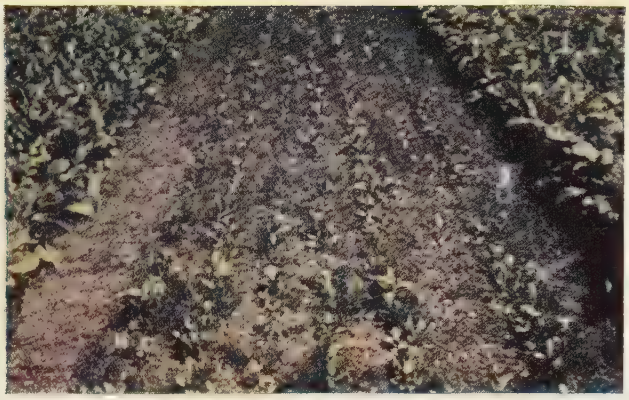
PHOSPHATE DEFICIENCY



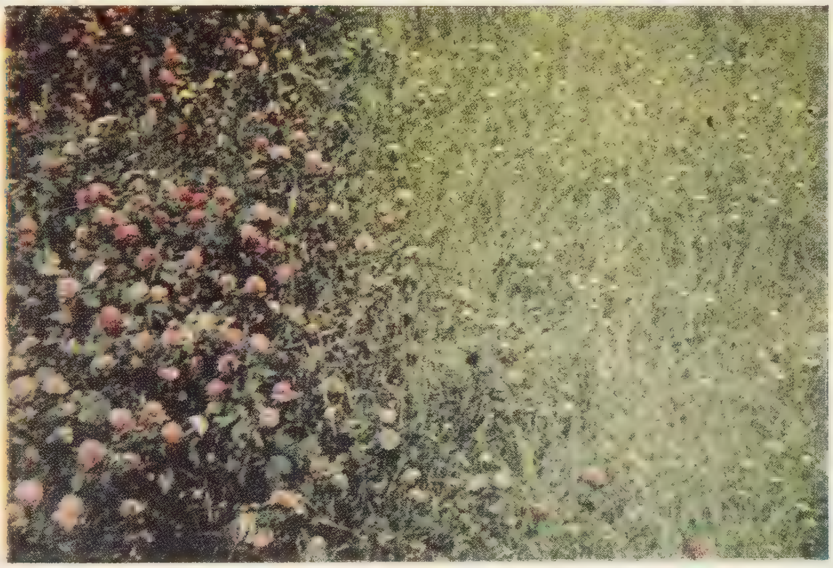
Some soils respond to phosphate without sulphur, as shown by this trial in Nelson. Others respond to sulphur without phosphate.



Some crops are very susceptible to phosphate deficiency, as the centre (untreated) strip in this kale crop in South Canterbury shows.

MOLYBDENUM DEFICIENCY

Molybdenum is one of the most critical deficiencies of the marginal areas of the South Island. Lack of it can severely limit plant growth. The effect on legumes is clearly demonstrated here. The right-hand portion of the area shown received superphosphate; the left-hand portion received molybdic superphosphate.



Molybdenum deficiency is widespread in the South Island; it occurs from Nelson to Southland. Areas such as this in North Otago were found to be critically deficient.

A trial in Marlborough which has shown that very good responses to molybdenum can be obtained in that province.

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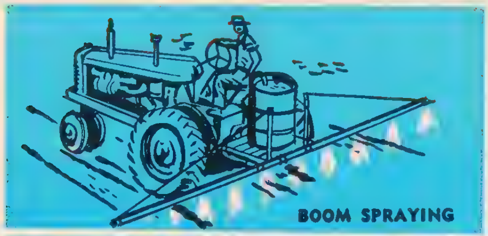

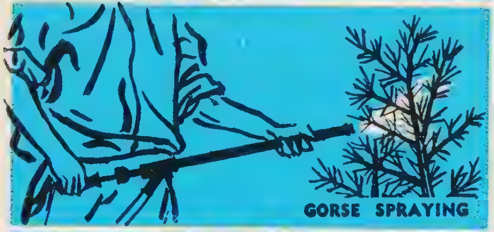

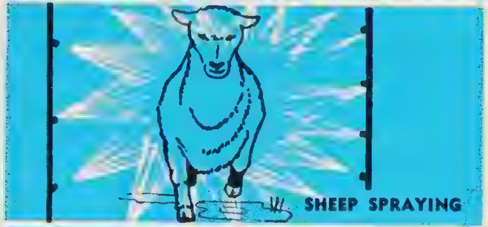

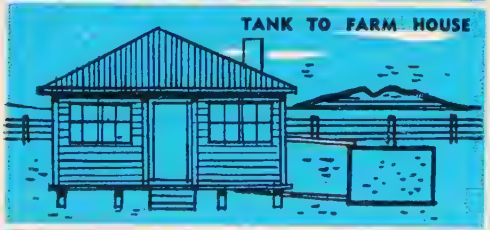

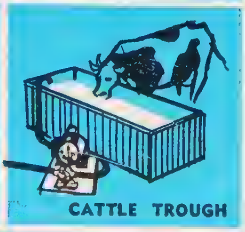

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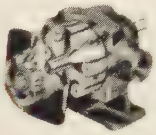

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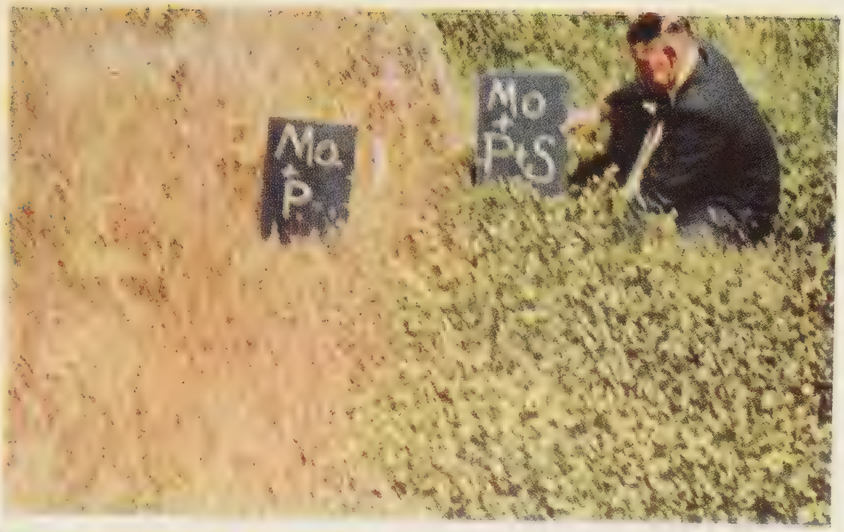
MULTIPLE DEFICIENCIES

Where multiple deficiencies occur all must be corrected: Response from molybdenum, phosphorus, and sulphur, but none from molybdenum and phosphorus only.



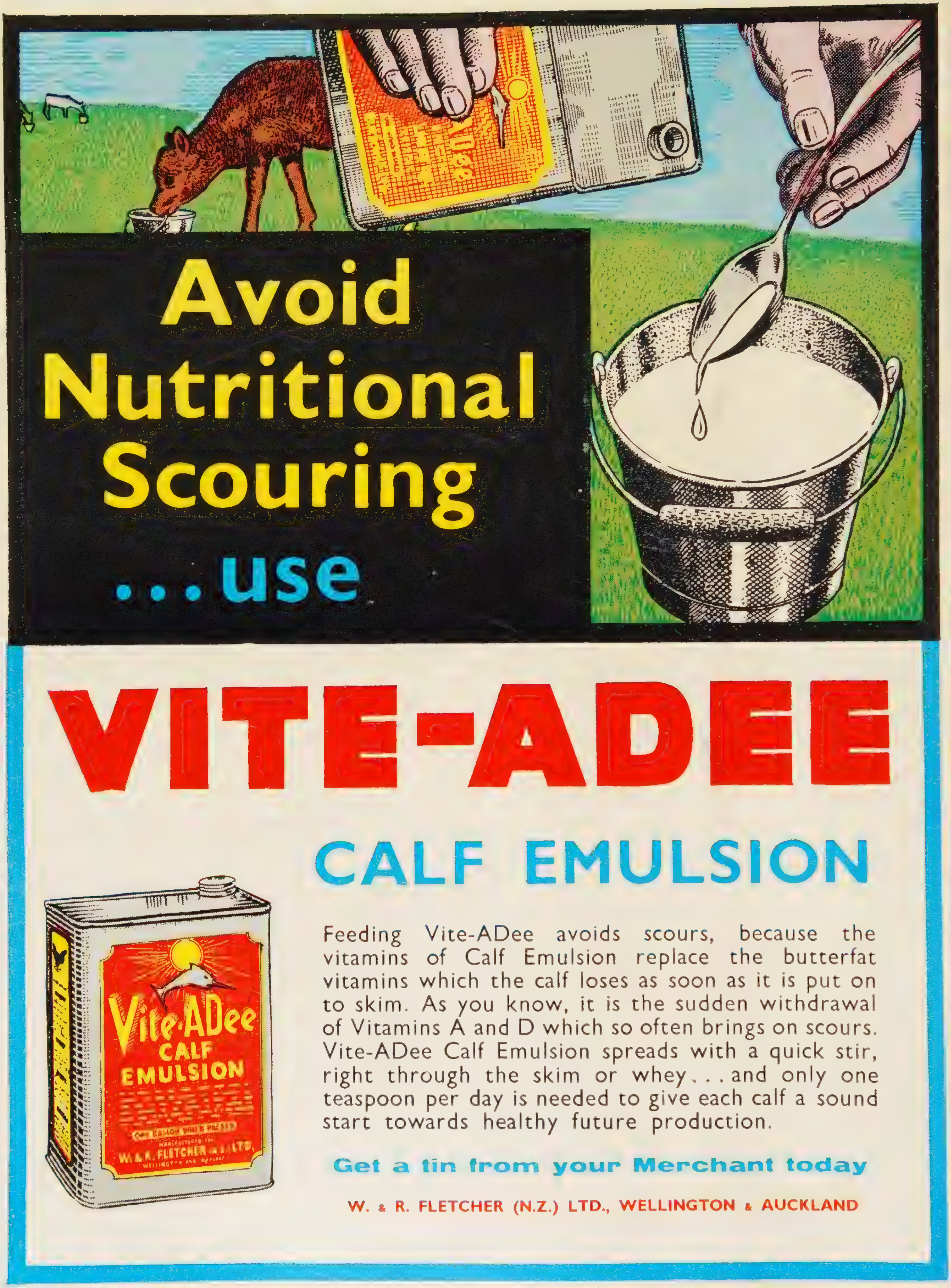
INOCULATION

In many areas inoculation of the seed has improved results as shown by the difference in inoculated and uninoculated plants here.

Correction of nutrient deficiencies will not necessarily overcome an inoculation problem. The whole of this area received adequate lime, molybdenum, phosphorus, and sulphur (and was possibly deficient in all these), but only a few clover plants nodulated sufficiently to grow well.

TIME OF SOWING

Time of sowing may be important in the oversowing of the marginal areas of the South Island. Winter sowing is recommended, even in conditions as rigorous as these.



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In low-rainfall areas cropping plays a significant part in the efficient use of fertilisers. After efficient cultivation and the breakdown of organic matter many crops can be grown without fertiliser. On the other hand brassica crops may require liberal dressings of phosphate.

to find soils in the high-rainfall areas which have no other deficiencies, a relatively high pH, and low organic matter content that are very responsive to sulphur. These are soils of recent origin. There are also soils in the low-rainfall groups which have a high organic matter content but which are deficient in sulphur.

In any discussion of sulphur deficiency the organic cycle must be taken into account. Consequently the effect of cropping in an arable system is important. For instance, cultivation alone has sometimes corrected sulphur deficiency.

From the previous discussion two important points about sulphur deficiency emerge—once the purely mineral deficiencies, such as of phosphorus and/or molybdenum, have been corrected or shown not to exist:

- Where climatic conditions are favourable for high-producing permanent grasslands (in most of the inland foothills with a rainfall of 35 to 60 in. which are at a reasonable elevation and have high summer temperatures) full utilisation of pasture by stock to permit turnover of nitrogen and sulphur is important.

- Where rainfall is low and unsuited to a purely grassland system of farming, efficient cultivation and cash cropping can assist to offset sulphur deficiency and provide maximum returns with the lowest input of fertiliser.

Though these two points have been stressed, it is doubtful if many farmers have really considered adopting the requisite practices.

Two interesting examples of how the recommendations could be implemented are by:

1. Cash cropping on the sulphur-deficient downs of North Otago.
2. Conservation of hay and silage for full pasture utilisation on the 40 in. rainfall areas of the Canterbury foothills.

Results Vary with Forms of Sulphur

Variable rainfall and different crops also influence the results obtained with different forms of sulphur.

Generally elemental sulphur (the cheapest form in New Zealand) will correct sulphur deficiency. However, this form is slower acting than the various sulphates, as its availability to plants depends on bacterial conversion. This, too, is influenced by particle size; the finer the particles are the quicker does the sulphur become available. Gypsum (calcium sulphate), the form in which sulphur occurs in superphosphate, is quickly available to the plant.

There are four matters concerning the form in which sulphur is used which should be appreciated:

1. For plants which grow and mature rapidly sulphates (gypsum or superphosphate) may be necessary; the finest-particle sulphur (flowers of sulphur) may be only partially effective and coarser material ineffective.

2. In the topdressing of pastures with sulphur the most important factor will be legumes. If these are already present, any form of sulphur is effective, but sulphates are quickest acting; fine sulphur is next best and other forms will become effective in time according to particle size.

3. Where no clovers are present results from sulphur will depend on the time of application and the form used and whether the district or season is wet or dry. Thus sulphates can be superior to sulphur in dry districts or in years of low rainfall, whereas sulphur can be better than sulphates in wet districts or in seasons of high rainfall.

4. The effect of rainfall and soil type on leaching of the materials is important and on this would depend the rates and frequencies of application; this in turn is affected by management as already stated.

Rates of Application

Application rates for various areas will have to be worked out. These are likely to vary with soil type, rainfall, and management. For initial land development, rates of 20 to 60 lb of sulphur per acre appear necessary at present. For some areas a much higher rate may be needed.

Applications of 30 to 40 lb have given sufficient improvement up to the point where stock numbers and/or capital improvements (fencing, etc.) limit utilisation of the pasture grown.

Gypsum, the form of sulphur in superphosphate, is that most used in agriculture. It has the least residual effect. In high-rainfall districts, on free-draining soils, in wet years, and under irrigation sulphur may be leached from the soil if applied in the form of gypsum in superphosphate before the plant can use it. Trials

TARTAN

topics

W.3

CLOVER DAMAGE BY HORMONE WEEDKILLERS

An extensive study of clover damage by hormone weedkillers has been made by the Department of Agriculture and others over a period of many years. The results are complex in detail, but broadly are as follows:—

1. 2,4,5-T is harder on all clovers than 2,4-D or M.C.P.A.
2. M.C.P.A. is less damaging than 2,4-D to fully grown clovers, especially red clover.
3. Young growing white clovers are usually suppressed by M.C.P.A. for a longer period than by 2,4-D.
4. Young growing clovers suffer more damage than older clovers.
5. M.C.P.B. and 2,4-D.B. are slight in their effect.
6. Red clover is more readily damaged by M.C.P.B. and 2,4-D.B. than white clover.
7. M.C.P.B. is less damaging to red clover than 2,4-D.B.
8. Hard grazing before spraying reduces clover damage slightly.
9. Clover is far less subject to damage in winter dormancy or in decline in drought than when in full spring growth. The beginning of spring growth is a very sensitive stage, especially for M.C.P.A. Late autumn is also sensitive especially for 2,4-D.
10. Clover seeds fallen to the ground suffer no germination loss from spraying.
11. M.C.P.P. (Methyl-chlorophenoxy-propionate). A superior but expensive cereal spray not on N.Z. market is very hard on clover.
12. Esters are harder on clover than water based compounds.

FAT LAMB WEIGHTS: Research has proven that spraying pasture may seriously depress fat lamb weight gains, presumably as a result of suppression of clover growth. The depression was estimated to amount to 14 lb dressed weight per acre.

RECOMMENDATIONS: Clover damage is now recognised of much greater importance than it generally was. Recommendations for the use of Tartan Weedkillers are written so that in following them clover is not damaged more than necessary.

1. Spot spraying rather than boom spraying should be done where practicable.
2. Spraying should be done during clover dormancy where possible.
3. M.C.P.B. should be extensively used notwithstanding its high price and at times imperfect weed control.
4. Spraying of most weeds should be done at a suitably young stage to allow M.C.P.A. rather than 2,4-D to be used, and also to allow light application rate.

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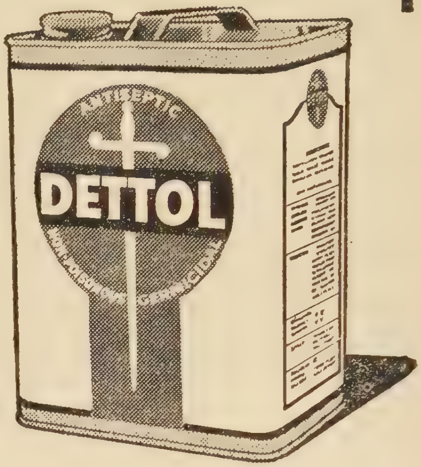

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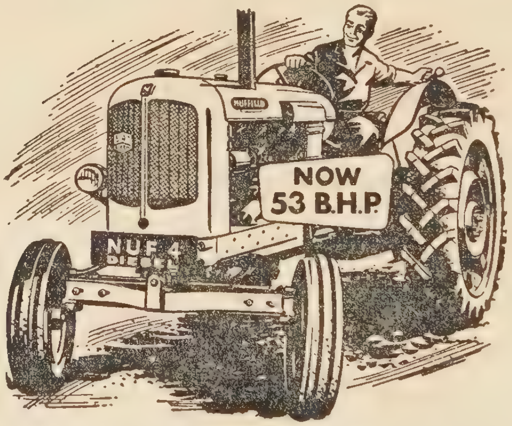

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have shown that with rainfalls of 20 to 25 in. on fairly retentive soil an application of 2 cwt of superphosphate (giving about 1 cwt of gypsum) the residual effect lasted for about a year. Under higher rainfalls and on free-draining soils the effect may be much less lasting.

A trial near Ashburton on Lismore stony soil with a rainfall of about 27 in. has given a guide on residual effect. It has shown that if superphosphate is not used for two years on soils which have had their fertility built up over many years by regular dressings of lime and superphosphate, the sulphur level falls to the extent that it limits pasture production. In the trial, part of the area which received no sulphur yielded 2,810 lb of dry matter per acre in 1955, 5,492 lb in 1956, and 6,297 lb in 1957. A similar area which received sulphur produced 2,830 lb, 5,559 lb, and 7,078 lb respectively in the same years. The first cut was on 6 September 1955 and the first significant increase attributable to sulphur was noted on 4 April 1957.

Four subsequent cuts all gave significant increases. In their original state Lismore stony soils are deficient in sulphur, phosphorus (especially), molybdenum, and lime.

The residual effect from sulphur does appear to be greater than that from gypsum. On some soils where management has been good the decline in sulphur does not appear to be rapid, as there seems to be little falling off of production in trials now in their fourth year. Retention of sulphur will vary considerably, as it depends on rainfall and build-up and decay of organic matter.

A reasonable application of sulphur appears to be 30 to 40 lb, 10 lb from the gypsum of superphosphate and 20 lb from the added sulphur in mixtures mentioned later. Some areas will require more than these amounts.

Phosphorus

The next most important deficiency is phosphorus and more work has been done with this than with any other element. This deficiency is widespread, possibly more so than that of sulphur. It occurs on many of the areas already mentioned as sulphur deficient and in others not yet so classified. This applies to Nelson, the West Coast, the Marlborough Sounds, Banks Peninsula, and no doubt many parts of Otago and Southland.

Where both deficiencies occur (and this is true of millions of acres of the foothills, terraces, downs, and plains) crops which need phosphate, especially brassicas (rape, turnips, swedes, kale, and chou moellier), may respond to phosphates alone and not to sulphates. This is one of the many reasons why undue stress has been placed on the use of phosphates in these areas in the past.

There is, therefore, a range of deficiencies from those for which sulphur is needed but no phosphorus to those requiring the application of phosphorus but no sulphur. Intermediate between these are some variable reactions in soils brought about by the relative requirements of plants and the cultivation of the particular soils. Thus on the one soil the Department of Agriculture may in future recommend phosphate only for some crops (brassicas), sulphur only for pastures, and no fertiliser for other crops (wheat).

Phosphate is not readily leached from soils and as on most of the soils where sulphur deficiencies also occur it is not being readily fixed, a build-up of phosphate may not be accompanied by a build-up of readily available sulphur.

Burning before sowing is not usually recommended, but may be desirable if the growth is so heavy that the oversown seed will not strike. A certain amount of cover in open swards provides desirable seedbed conditions for clovers oversown in winter.

Molybdenum

Each year further molybdenum-deficient areas are being located. The deficiency is most variable and seems to occur as a mosaic on many soils. Often, but not always, the deficiency is associated with a major deficiency of sulphur or phosphate or with both. Molybdenum deficiency is widespread, occurring in many parts of Nelson, Marlborough, North, South, and Mid Canterbury, Banks Peninsula, North and South Otago, the Otago Peninsula, and in Southland. It affects all crops.

The deficiency is quite important in some areas where in the past lime application was the main method of improvement. The light lands of the Canterbury plains come into this category, as a large number of trials on unimproved sites are now showing big responses to molybdenum.

Molybdenum in the small amounts per acre needed is cheap, is easy to apply, and it can be used at any time. It can be sown with the seed or fertiliser or sprayed on.

Rates of application have tended to be low, but before any higher rates are used advice should be sought, as an excess of molybdenum can cause nutritional troubles in ruminants.

Molybdenum deficiency can cause most severe restriction of plant growth and affects nearly all crops.

Manganese

There is some indication that manganese deficiency may be of importance in parts of Canterbury. However, an excess is more likely and this will give symptoms typical of molybdenum deficiency.

Lime will suppress manganese uptake and has been used with beneficial effect for this on acid soils. Where manganese deficiency occurs, however, lime may have adverse effects. This appears to have happened in a number of trials in South and North Canterbury.

Boron

Boron may have special significance in Nelson and perhaps in parts of Central Otago and for particular crops; otherwise it has not been shown to limit the initial improvement of any of the areas under discussion.

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Lime

With lime the significant features are:

1. Many areas can be greatly improved without applying lime, even though they may not reach their maximum production without it.

2. Lime has been effective in many areas indirectly as the result of its releasing molybdenum.

3. In many instances it has greatly assisted the nodulation of legumes.

4. In some areas it suppresses excesses of other elements (manganese, iron, and aluminium).

5. On many soils molybdenum deficiency is corrected more effectively by the addition of lime rather than molybdenum, as lime has a number of beneficial effects which molybdenum does not possess.

6. It was once considered that for good legume production lime was a major requirement on most soils, but it is now thought that once nodulation has occurred this may not be so.

7. It may be possible under **some** circumstances to achieve this nodulation with rates of lime as low as 2 to 3 lb per acre when it is used as a coating on the seed.

Because so many of the results discussed have been obtained without lime, it is not considered of major importance.

Inoculation

There are many areas where oversowings without inoculation are satisfactory. In others inoculation of the seed has improved results, though they have been relatively satisfactory without it. In some areas—generally the most difficult, both dry and wet situations, and frequently those having multiple fertility deficiencies—inoculation is essential.

On areas where inoculation is a problem special treatments in order to obtain nodulation have been found to be essential in a very few cases, slightly additive in effect to inoculation in several instances, or quite unsuccessful in some difficult, dry situations.

Of the special treatments, lime pelleting of seed has received most attention. This has given results in a few cases. Other materials which may be of equal interest are charcoal (carbon) and magnesium carbonate. In a number of areas the latter has given plant responses which are almost certainly associated with its neutralising effect on acid soils. This has been so in Canterbury, Marlborough, and Otago. Used as a seed coating at very low rates it has in one case been considerably better than lime. Other methods of seed treatment require further study.

Where seeds have been subsurface introduced on difficult sites there has been some improvement in nodulation in Otago, Canterbury, and Marlborough. However, subsurface introduction of seed over a wide variety of soils has not proved necessary provided a **suitable** oversowing time has been chosen.

Time of Oversowing

Many of the best oversowings have resulted from mid-winter (June and July) sowings. There is some latitude and generally oversowings can be later in districts of higher rainfall or those which do not have early summer droughts.

Management

Though management for establishment and for maintenance of the pasture in the early stages is influenced by climate and the season, two points to consider are very light or no grazing at establishment and a reasonable spell for flowering and seed setting in the first year. The latter is not essential if the climate is suited to perennial plants, fertility is to be maintained by re-topdressing, and initial establishment is dense and even, which with aerial sowings it seldom is.

Correcting Deficiencies

The ratio of sulphur to phosphorus needed for the areas referred to in this article will vary from district to district. However, in soil organic matter the ratio is normally a fairly constant two of sulphur to one of phosphorus. The ratio in superphosphate is 1.3 : 1, indicating that on soils low in organic matter only 65 per cent of the phosphorus could be used in organic matter build-up, even if the whole of the sulphur available from superphosphate were used for this purpose. Thus some variation in the sulphur : phosphorus ratio of the fertiliser, and in the form of sulphur, may be necessary in some circumstances.

For that reason fertiliser mixtures with a higher proportion of sulphur than that in superphosphate have been manufactured. Sulphur rather than gypsum has been added, because it is considered that this will give a greater residual effect and therefore make correction of sulphur deficiency much cheaper.

The most widely used of these mixtures contain 240 or 400 lb of added sulphur per ton. The sulphur particles are of variable size, but all relatively fine, passing a 10 mesh sieve. This is much coarser than flowers of sulphur. The added sulphur is much slower acting than flowers of sulphur, but the mixtures also supply quick-acting sulphur from the gypsum (sulphate) portion of the superphosphate.

The following table shows how the ratio of sulphur to phosphorus and the amount of sulphur as the element and as supplied by the gypsum of superphosphate vary:

	Lb per cwt			
	Phosphorus	Sulphur as gypsum	Sulphur as element	Total sulphur
Superphosphate	10	12.5	—	12.5
Mixture of superphosphate and 240 lb of sulphur	9	11.2	12	23.2
Mixture of superphosphate and 400 lb of sulphur	8.2	10.2	20	30.2
Mixture of superphosphate and 800 lb of sulphur	6.4	8	40	48
Sulphur	—	—	112	112

From these figures the cost of correcting sulphur deficiency by adding say 30 lb of sulphur per acre by use of any of the materials mentioned can be worked out. On the basis of £10 per ton for superphosphate and £25 for sulphur the relative cost (compared with that for sulphur alone) would be:

	Quantity of fertiliser to add 30 lb of sulphur per acre	Cost per acre	
	cwt	s.	d.
Superphosphate	2.4	24	0
Super. plus 240 lb sulphur	1.3	15	1
Super. plus 400 lb sulphur	1.0	13	2
Super. plus 800 lb sulphur	0.6	9	10
Sulphur	0.4	6	8

Conclusion

A number of questions remain unanswered. Improvement of these areas with the fertilisers mentioned is likely to result in a very small fall in pH owing to the build-up of organic matter through the combined action of clovers, the correction of sulphur, phosphorus, and molybdenum deficiencies, and the excreta of the grazing animal. This may, or may not, indicate that lime will be needed in the future.

It is not possible to measure what the increase in carrying capacity from the improvement of this class of country will be, as this depends on many factors other than soil fertility. Important among these are the length of the growing season, rainfall, elevation, topography, frequency of storms, subdivision, management, and stock replacement. However, some very important changes could occur and improvement of large areas of this low-producing land could have important influences on the whole economy of the South Island.

Development of the foothill country depends on the correction of mineral deficiencies which limit nitrogen fixation by clovers and no spectacular improvement is likely until this basic requirement is met.

Care of Livestock during October

Contributed by the Animal Research Division

CATTLE TICK CONTROL

WHERE cattle ticks are plentiful spraying or dipping should be done in November and December to prevent tick worry and to kill the adult female ticks before they lay their eggs.

BLOWFLY STRIKE IN EWES

In districts where crutch strike causes trouble in ewes crutching or early shearing is advised. Close supervision is necessary to detect cases so that suitable treatment can be applied before the strike becomes too extensive. When treating cases of fly strike shear the soiled wool away from the immediate vicinity of the strike. Dressings containing aldrin, dieldrin, diazinon, or BHC will rapidly kill the maggots, which will be expelled from the wound. In addition treatment with aldrin, dieldrin, or diazinon preparations will prevent restrike until dipping if this is done in January. These dressings do not prevent the flies blowing the sheep with eggs, but they do prevent the maggots from hatching and causing a strike.

Irritant fluids such as kerosene should not be used; they may kill the maggots, but they will irritate the wound and tend to cause restrike.

Jetting ewes is not usually necessary, but if fly strike is severe, it may be advisable to treat them to give protection until dipping. Apply ½ gallon of aldrin, dieldrin, or diazinon wash to the crutch of each animal, extending the wetted area to above and round the tail. A pump working at 40 lb to 60 lb pressure per square inch, with a hand cut-out on the nozzle, is advisable for this purpose.

BLACK DISEASE VACCINATION

In east coast areas of the North Island where black disease of sheep occurs vaccination should be done during November or early December. This will protect against the disease, which occurs mainly in the summer and autumn. Vaccine should be ordered immediately.

BLOOD POISONING AFTER SHEARING

Deaths in sheep after shearing may be due to infection of cuts or bruises with the blackleg germ. This disease can be prevented by vaccinating at least three weeks before shearing. Sheep which have been vaccinated previously may not require revaccination, and a veterinarian or Livestock Instructor should be consulted about the best procedure.

BLACKHEAD DISEASE IN POULTRY

Blackhead in poultry was once considered to be essentially a disease of young turkeys, but in recent years it has also caused serious losses among chickens. Blackhead in turkeys must be suspected where the young birds lose appetite and condition coupled with the appearance of loose, yellow droppings. Mortality can be heavy. Affected chickens show similar symptoms to those for coccidiosis except that blood is not seen in the droppings. Again mortality may be heavy. Where the disease is suspected in either turkeys or chickens an immediate approach should be made to the local Poultry Instructor, as drugs are available which are most effective in control of this disease.

SUPPLEMENTARY FEED

Supplementary feed is essential to ensure the proper feeding of cows in winter and in dry summers and to control facial eczema in autumn. As soon as more pasture is available than is necessary to meet the immediate needs of stock the balance should be shut up for silage or hay. On a well managed dairy farm it should be possible to shut up at least 40 per cent of the pasture.

Crop growing for fattening of weaned lambs is standard practice in South Island districts and it could with advantage be adopted more widely in North Island districts which experience a dry summer. Crops such as thousand-headed kale, chou moellier, and turnips, in addition to providing excellent fattening feed for lambs, are a splendid insurance against facial eczema. In Poverty Bay and Hawke's Bay they should be sown before the end of October so that they can be well established before dry weather sets in.

MATING OF DAIRY COWS

Before each cow is mated two heat periods or an interval of at least 30 days should be allowed after calving. Cows mated before this period are less likely to get in calf, and the chances of contaminating the bull are increased. Hand-mating should be practised and accurate records kept showing the bull used and dates of all services. Should breeding trouble occur these records will be of considerable assistance in arriving at a correct diagnosis.

COCCIDIOSIS IN CALVES

Scouring in calves under six months of age is seldom due to worms; it is much more likely to be due to coccidiosis, especially if blood is present in the droppings. Effective drugs are available for treatment, but these can be obtained only on the prescription of a veterinary surgeon, who should be consulted.

ARSENIC POISONING

Most deaths in cattle, sheep, and dogs from arsenic poisoning are caused by their drinking from foot rot baths containing arsenic. If arsenic is used, baths should be fenced off from stock and also made inaccessible to dogs, which are prone to drink from them when they are round the sheep yards. Cases occur throughout the year, but the greatest number occur in November.

EARLY WEANING OF LAMBS

Where early weaning of lambs is practised on hill country suitable areas should be spelled early this month for weaned lambs.

EARLY WEANING OF CALVES

If dairy calves are to be early weaned, July-born calves should be weaned. Jersey calves should attain 120 lb liveweight, equivalent to 33½ in. in chest girth, before weaning on to rotationally grazed pastures.

Crop and Seed Production

Seasonal Notes by the Farm Advisory Division

PREPARATION of land for spring-sown fodder crops should now be considered. Firm, clean seedbeds prepared early contribute much to good yields.

SWEDE VARIETIES FOR NORTH ISLAND

AS a pioneer crop swedes have played an important part in land development in the North Island.

Good drainage, an even supply of moisture, and ample organic matter are necessary for a heavy swede crop, but the advantage of this crop is that it is capable of giving a fair yield under low-fertility conditions. Swedes generally follow run-out pastures, which should be ploughed and disced early to allow ample time for the breaking down of the turf. A firm, fine seedbed is necessary, and consolidation is very important, especially on the volcanic soils. Early sowing of swedes is essential in many areas to overcome damage from insect pests.

The main varieties grown, in order of importance, are: Superlative, Crimson King, Grandmaster, Sensation, Calder, and Wye.

Superlative is an early maturing, high-yielding swede of good texture. It is suitable for wintering young sheep, but will not keep late into winter. It grows well in all districts with ample moisture and is popular in the Wanganui district.

Crimson King and Grandmaster swedes grow well in the wetter inland districts. They are later maturing than Superlative and are capable of standing severer winters. In the King Country Grandmaster has outyielded Superlative in field trials. It is popular in Taranaki.

Sensation and Calder are slower-maturing swedes capable of yielding well under the drier conditions of Hawke's Bay and the Wairarapa. Their outstanding virtues are their ability to withstand aphid attack and their resistance to turnip mosaic disease.

Wye is resistant to clubroot and produces fair crops in areas where this disease makes it impossible to grow other varieties, as in some areas in the Waimarino County.

—*G. R. MOSS, New Plymouth*

* * *

MAIZE FOR GREEN FEED

FEATURES which make maize a suitable crop for summer green feed are its heavy yield, propensity to smother weeds, and ability to tolerate mechanical and chemical weed control measures. Maize will not tolerate frosts and should be sown only when frost danger is over, early November being suitable for northern districts. Early ploughing and thorough cultivation will ensure that populations of army worms, caterpillars, and other insect pests are reduced to a minimum.

Seed is sown at 100 to 120 lb per acre, either by drilling in 14 in. rows or by broadcasting and discing in. As this crop requires a high level of soil fertility to achieve maximum growth, it should not be sown on very poor areas. Even on relatively fertile paddocks maize will respond to applications of 3 cwt of superphosphate and 3 cwt of blood and bone per acre. After the crop has established, and up to the 6 in. stage of growth, maize may be harrowed to destroy germinating weed seedlings provided this is done in the hottest part of the day when the crop is flaccid from loss of moisture. In spite of appearances to the contrary the crop is very little harmed by such harrowing. Later, if this should prove necessary, 2,4-DB hormones may be used at 1 to 2 lb acid equivalent per acre, depending on the growth stage of the weeds, to destroy broad-leaved seedlings. Normally, however, chemical weed control measures are not required in maize crops.

—*B. A. GUNNING, Matamata*

* * *

SUMMER SUPPLEMENTARY FEEDS

THE provision of suitable summer fodder supplements is essential on fat lamb and dairy farms in most districts in the South Island, along the east coast of the North Island, and where lengthy dry summer periods are frequent.

Reliable lamb-fattening feeds for summer are rape, lupins, or mixtures of these. Trials have shown the Borre lupin to be a good summer and autumn producer and useful for combining with rape. Lucerne/cocksfoot mixtures have become popular for special-purpose grazing and are particularly suited for medium to light plains soils. Less reliable alternatives, but still worthy of consideration, are mixtures of turnips and grass, and turnips, lupins, and grass. Turnips have lost favour in recent years because of their periodic susceptibility to mosaic virus. However, if the turnips fail, the associated grass or lupins provide alternative feeding. Short-rotation or Italian ryegrass sown with quick-maturing York Globe turnips in October provide good summer forage.

The use of green feed maize is fairly widespread in the North Island and is increasing in Canterbury. It has proved a most reliable safeguard against summer drought for dairy farmers producing whole milk. This crop is best sown in November when all danger of frost is past, and is normally ready for feeding from mid January on. Milk production is well maintained by stock feeding on the green, leafy, succulent stalks.

Cereal green feeds can be sown either alone or with grass from January on, and the resultant feed may be used for milking cows, finishing off lambs, or flushing ewes. The cereal varieties most suited for providing quick summer feeding are Cape barley and Abundance and Russet oats. For later feeding C.R.D. ryecorn and Winter Grey oats are recommended.

The recent practice of overdrilling cereals with and without grass into clover-dominant or run-out pastures has given encouraging results and is suggested for those dairy farms where overhead irrigation systems are installed and where suitable sod-seeding equipment is available.

Important factors which ensure a maximum bulk of summer feed are timely and adequate cultivation for suppression of weeds and conservation of moisture and the correct use of phosphatic and nitrogenous fertilisers.

—*D. J. G. DAVIES, Christchurch*

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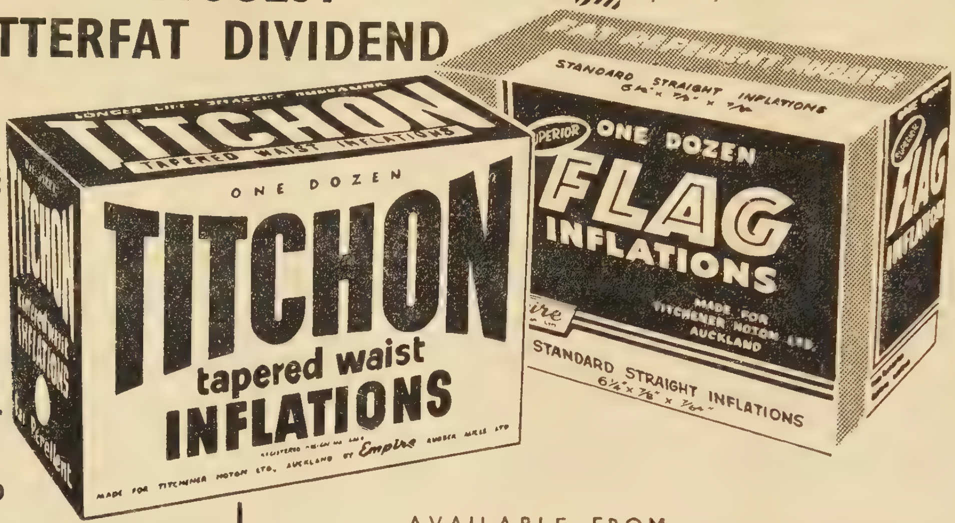
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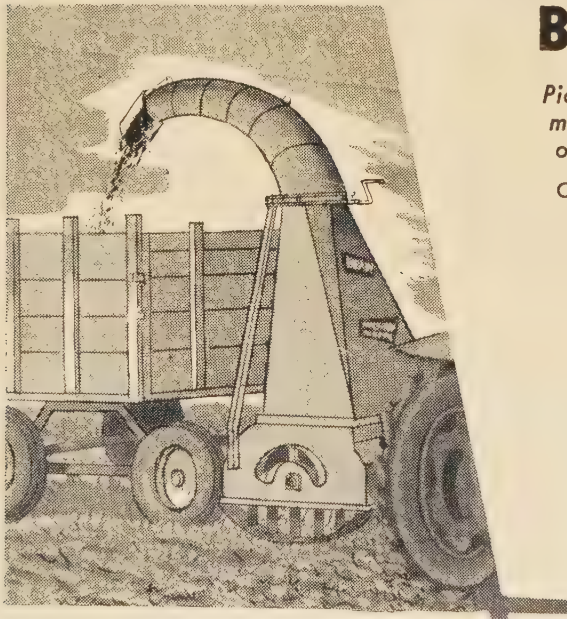

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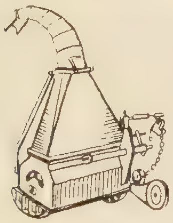

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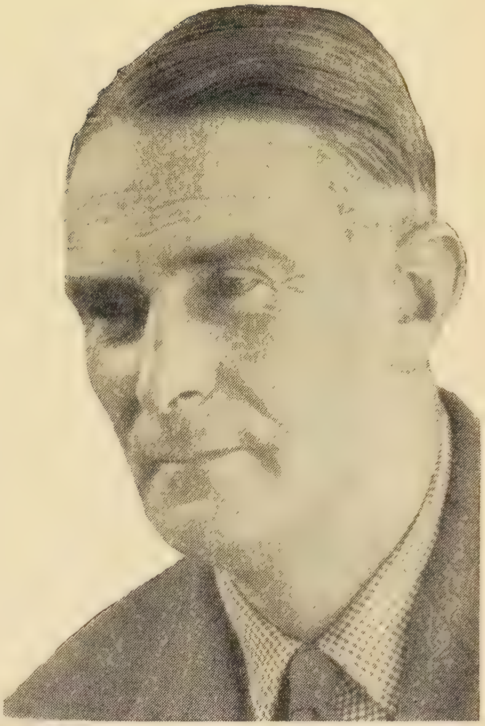
Cereal Growing in the Waikato

By I. L. ELLIOTT*,
Superintendent, Department of Agriculture Rukuhia Soil Research Station, Hamilton

AT last year's Ruakura Farmers' Conference it is perhaps fair to say that a faint note of despondency was detectable. Dairy and wool prices had dropped and beef seemed to be the only commodity in keen demand. It was in such an atmosphere that Dr C. P. McMeekan, reviewing his impressions of a recent overseas visit, said, "Whether we like it or not, I believe we have reached the stage when we must abandon to some degree at least our belief in extreme specialisation as the best way to farm this country. Some measure of diversification is necessary now." Though Dr McMeekan did not fully commit himself, he at least hinted later in his paper that cereal growing might form part of the diversification programme.



MR ELLIOTT: I believe that there is a place for the growing of cereals in the Waikato, and their growth can be highly profitable to the farmer.

← Information on the best varieties to grow in the Waikato is greatly needed and further trials are contemplated. Pictured is last year's variety trial at Ruakura, where Gabo gave the highest yield. The lodged variety is Tainui.

IN throwing out this challenge I believe that Dr McMeekan was, and still is, essentially sound, and if the spirit at this time is somewhat lighter than it was at the same time last year, I believe that, apart from the hardening of overseas prices for our primary produce, the main reason is to be found in the extraordinarily productive season which in many cases must have minimised the apparent drop in income which faced the farming community.

I believed at that time, and I still do believe, that there is a place for the growing of cereals in the Waikato, and their growth can be highly profitable to the farmer. This paper reviews the past, discusses some of our more recent knowledge, and assesses the probabilities of future success in this sphere.

TABLE I—ACREAGES IN CEREAL CROPS AT 10-YEAR INTERVALS IN AUCKLAND DISTRICT FROM 1869 TO 1952

		Oats			All
Year	Wheat	Threshing	Chaff	Barley	cereals
1869 ..	2,321	1,797	—	134	4,252
1879 ..	6,635	4,048	7,800	369	18,852
1889 ..	14,701	12,333	9,914	1,316	38,264
1899 ..	12,261	8,882	37,745	2,123	61,011
1909 ..	2,602	2,690	45,602	1,628	52,522
1919 ..	214	235	14,903	186	15,538
1929 ..	137	16	2,410	84	2,647
1939 ..	77	16	1,990	174	2,257
1949 ..	55	26	2,619	173	2,873
1952 ..	24	1	1,094	175	1,294

Historical

Cereal growing was well established in the Auckland district before 1900, as is shown in Table 1, which sets out the acreages in wheat, oats, and barley at 10-year intervals from 1869 to 1952. It shows that cereal growing reached its peak in the 80s and 90s and fell off dramatically after 1909.

TABLE 2—WHEAT YIELDS FOR DOMINION AND AUCKLAND DISTRICT FROM 1869 TO 1952

Year		Yield per acre	Dominion yield per acre	Difference
		bus.	bus.	
1869	..	15.4	—	—
1879	..	23.8	22.94	+.9
1889	..	26.8	24.22	+2.6
1899	..	20.3	32.76	—12.4
1909	..	35.6	34.75	+.9
1919	..	28.4	31.57	—3.1
1929	..	24.0	34.60	—10.6
1939	..	26.6	29.40	—2.8
1949	..	37.5	40.61	—3.1
1952	..	38.2	43.25	—5.0

Table 2 sets out the average yields in bushels per acre for the same years as in Table 1 and compares them with the Dominion average wheat yield for the same periods. Interesting points arise from both tables. It would seem reasonable to assume, for instance, that in the days before 1900 cereals

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* This article is an adaptation of a paper given by Mr Elliott at this year's Ruakura Farmers' Conference Week.

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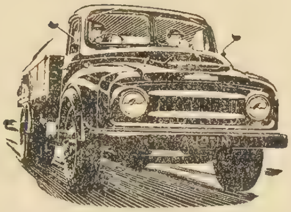

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5.8A

were grown to ensure survival when communications with wheat growing areas were poor, and that under these circumstances the poor yields obtained were no deterrent to their being grown. It appears, too, that the sudden drop in the wheat acreage after 1900 corresponded almost exactly with the rise of the dairy industry and the commencement of pasture topdressing.

In each of the specified 10 years from 1869 onward, though yields have shown a tendency to increase, only on three out of the ten occasions has the average Auckland wheat yield per acre exceeded that of the Dominion as a whole.

Apart from these particular three years, the general average yield of wheat per acre in the Auckland Province has been four bushels less than the Dominion average.

Many reasons have been advanced for the decline in cereal growing, chief among them no doubt being the relative ease with which grass can be grown with the aid of topdressing and good stock management. Relative prices between pastoral products and grain are also likely to have played a major part in determining the trend toward grassland. It has, however, frequently been said that bad harvesting conditions played a major part, but this I am inclined to doubt, because grain growing continued as a major farm enterprise for such a long time. Diseases of cereals were probably very rife in the district and must have lowered yields substantially, and probably contributed largely to the drop in cereal acreage.

Close up of wheat crop grown at Ruakura indicating its cleanness and promise at the stage just before harvest.

Whatever the factors responsible for the virtual cessation of cereal production some re-assessment of the situation at present is important on account of the radical changes in cereal growing which have taken place since the early part of this century.

Table 2 showed that there has been a relatively steady increase in the Dominion wheat yield per acre and that generally the yields in the Auckland district have followed the Dominion pattern. Since the war, however, Dominion wheat acreages have tended to fall to a very low level, with the consequent likelihood that wheat continued to be grown only on the best wheat soils. This would probably cause the Dominion yield per acre to be higher than it would have been had the area grown been larger.

FIVE REASONS

My reasons for suggesting that we should re-assess the possibilities of cereal production in the Auckland district are as follows:

1. Since cereals were grown fairly extensively about the last quarter of last century and for the first decade of this century, most of the ploughable land has been under grass and fairly constantly and heavily topdressed. Under the fertility-building regime which we have followed, it should be possible to grow much better than average crops.
2. There have been dramatic changes in the means of harvesting. The method of cutting with the binder and threshing through a stationary mill has given way to the header harvester which has immeasurably shortened the time necessary for harvest, and made it possible to harvest grain easily under conditions which would be extremely difficult with the older methods.
3. There have been great advances in plant breeding, and varieties have been produced which can outyield earlier varieties, exhibit greater resistance to disease, stand in ear for a long time without shattering, and are resistant to lodging.
4. It appeared to me that cereals could well follow on the winter feed crop of turnips or chou moellier, and could be harvested in plenty of time to allow the area to be resown to pasture. This would avoid the spring sowing of pasture, would encourage the elimination of certain weeds, and should be a means of cashing in on some of our unused and probably otherwise unusable fertility.
5. I believe cereal growing could be highly profitable to the individual farmer and could be carried on to a limited extent without affecting the existing rate of stocking on most farms. In this way it would be a diversification of farming activities which should result in appreciable gain to the farmer.

I now propose to examine the results of last season's cereal growing project in light of the five points on this page.

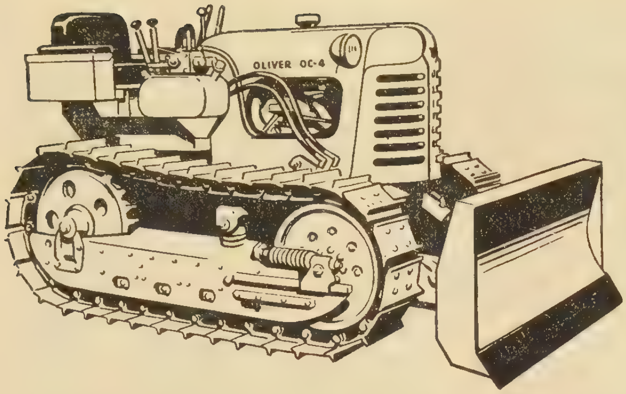
Table 3 sets out the acreages and yields in the districts where cereals were grown:

TABLE 3—APPROXIMATE YIELDS OF CEREALS DURING 1958-59 SEASON

District	Crop	Area acres	Yield bushels per acre
Otorohanga,	Wheat: Gabo	136.5	31.6
Te Awamutu	Tainui	24.5	45.8
	Barley	35.5	38.9
	Oats	33.5	—
Hamilton	Wheat: Gabo	16	30.75
	Barley	43	39.8
	Oats	14	21.35
Matamata	Wheat: Gabo	73	30.3

The acreages are farmers' figures, and generally probably err on the generous side, making yields lower than they might truly have been.

Secondly, the yields were mostly in terms of sacks and not in weighed bushels. However, as the wheat was



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mostly of poor quality I have computed yield at 2½ bushels per sack instead of at 3 bushels per sack as is normal.

Thirdly, most farmers held back a few bags for their own use or for sale to friends. However, within the limitations of the accuracy of the figures collected, it will be seen that on the point that we should grow better than average crops I was wrong. It is safe to say that on an average the wheat yields were at least 10 bushels below the Dominion average.

However, in spite of this evidence, I believe that under more normal conditions, much better crops would be grown. The experimental wheat crop grown at Ruakura gave every indication of yielding at least 60 bushels per acre. The prime factor which reduced the yield at threshing to just under 40 bushels per acre was disease, the common factor in the low yield of virtually all cereal crops this year. There was adequate fertility in all fields to have grown better than average crops.

A major obstacle to the whole project was that the type of harvesting equipment required was not available in the district. This was overcome when A. M. Bisley and Co. Ltd. generously made available harvesting equipment of the type necessary in the district and organised the harvesting project.

In spite of bad weather at harvest time a good job was done, and the great majority of crops were harvested without undue loss. The headers worked remarkably well, and though problems were encountered they were generally overcome.

Though we had no trouble at Ruakura, in many of the later harvested crops weeds were a serious problem, and it was necessary to cut some crops with a mower and pick them up from the windrows. It is obvious from our first year's experience that additional care and attention will have to be paid to cultivation and weed control.

On Point 2 I feel it is fair to claim success.

Point 3 dealt with varieties, and here it is difficult to know whether I was right or wrong. Certainly Gabo wheat, which was grown almost universally, had shown itself to be a good yielding wheat under North Island conditions. It grew well and stood up well, but seemed more prone to disease than I would have imagined. Obviously, if wheat growing is to retain a place in the farming of the Auckland Province, further attention will have to be given to the introduction of better varieties or to the control of disease by other methods.

On Point 4 I am sure I was right. The cereal crop did fit in excellently after a winter feed crop, and so far as I am aware there was no difficulty in preparing the stubble in plenty of time to sow down into new grass the following autumn. I am sure that where barley grass was a problem, as it was at Ruakura, the procedure of growing two successive crops would go a long way toward controlling it until the area becomes reinfested from outside sources.

A M BISLEY
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▲ This type of modern header harvester was used to harvest nearly all the grain grown in last year's cereal growing project in the Waikato.

Point 5 dealt with profitability to the individual farmer, and of course here it is only possible to look at the position on average. In Table 4 are set out what I believe to be fair average costs of production for yields of 30, 40, and 50 bushels per acre. The returns are set out in the same way, showing net profitability with sales of straw omitted and also included.

TABLE 4—PROFITABILITY OF WHEAT GROWING

Cost of production (30 bushels)		Gross return	Net return	Net return + straw
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Seed 2½ bushels at 30s.	3 15 0			
Fertiliser 2 cwt per acre	1 15 0			
Weed spraying ..	1 10 0			
Harvesting	2 10 0			
Cultivation	3 0 0			
Sack allowance . ..	7 6			
	12 17 6	21 15 0	8 17 6	14 17 6
	(40 bushels) 13 15 0	29 0 0	15 5 0	21 5 0
	(50 bushels) 14 12 6	36 5 0	21 12 6	27 12 6

In assessing the net return no allowance has been made for loss of butterfat or fat lamb which could have been produced if the wheat had not been grown. Nor do I see any reason why such provision should be made. No instance could be ascertained where cereals were grown and where there had been (a) either a reduction in butterfat produced as a result, or (b) a reduction in cows milked.

Obviously it would be easy to carry the area of wheat grown to a point where it would affect butterfat production, and if this were done, it would be necessary to allow for butterfat lost, but at least 5 to 10 per cent of a farm could be put into cereals without this happening.

In showing the net return per acre I have shown £6 per acre for straw. This is based on assumed production of a ton of straw per acre with 30 bales to the ton at 4s. per bale. This is no overestimate and a live market for good-quality straw exists.

Though the average yield last year was only about 30 bushels, this is far too low a figure to use for making future estimates. Last summer was exceedingly wet and it would be difficult to imagine a worse season for cereal production. Perhaps in some ways this was good, as it will introduce a note of caution into tackling this problem in the future. However, I believe it is perfectly reasonable to expect better results in the future and to base our estimates on about 40 bushels per acre.

Trial Crop at Ruakura

Last season the staff of Rukuhia conducted a wheat variety trial at

Ruakura. The results are set out in Table 5.

TABLE 5—EFFECT OF VARIETY AND RATES OF APPLICATION OF NITROGEN ON WHEAT YIELD

Variety	Mean bushels per acre	Difference
Gabo	40.0	7.0
Tainui	35.9	2.9
Aotea	33.0	—
Arawa	15.1	—17.9
Hilgendorf	26.7	—6.3
Nitrogen		
No nitrogen	33.3	—
1 cwt of sulphate of ammonia	28.4	—4.9
3 cwt of sulphate of ammonia	28.6	—4.7

Gabo, the variety recommended, showed up as the best, being statistically significantly better than all except Tainui. None of the others was worth considering. Nitrogen, contrary to expectations, gave no increases in production, and significantly depressed yield. In a further trial at Rukuhia though nitrogen did not depress yield, it failed to increase it.

The conclusions from the past season's cereal project are:

1. What evidence there is seems to suggest that Gabo is still the best variety to grow. Further information on more suitable varieties, if they exist, is, however, necessary.

2. Cereals should be grown as a catch crop after a winter feed crop, and not to an extent that their growth will interfere with production of butterfat or fat lamb.

3. Without assured provision for harvesting equipment, any attempt at cereal production is doomed to failure before it starts.

4. On the basis of a 40 bushel crop the net return would be £15 to £20 per acre, a very attractive proposition for the time the land is in crop and the labour and time involved. A poor crop is no good, but neither is a poor dairy farm or sheep farm.

5. There would seem to be no advantage to be gained from applied nitrogen. So far few trials have been conducted, and this opinion may require revision.

6. Last season was about as bad as it could have been, and it would seem reasonable to expect better results in future.

It is our intention to carry on with experimental work, and if the means of controlling stem rust and other fungus diseases can only be found, and there is some promise of this, much better crops of higher profitability to the farmer will undoubtedly result.

Any attempt at diversification of our agriculture will bring problems and some disappointments in its train, because any form of primary production has inherent risks.

It may well be that if overseas prices for our produce continue at much the same level as at present, farmers will prefer to carry on with a form of enterprise with which they are already thoroughly familiar. Should prices tend to fall again, however, a different attitude may easily be adopted, and unless we make some attempt to gain information about such things as cereal production, we may easily be lacking the information when we most need it.

All that anyone can do is to attempt to present such projects as fairly as possible and leave it to the good sense of the farming community either to accept or reject it. Whether or not cereal growing ever becomes of any significance in the Auckland Province is entirely a decision for farmers of the area.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given during October as follows:

1YA Auckland, 7.45 p.m.

1 October—"Black Beetle", by H. McM. Bull, Instructor in Agriculture, Department of Agriculture, Auckland.

8 October—"Topical Livestock Matters", by G. Durham, Veterinarian, Department of Agriculture, Papakura.

15 October—Talk by J. E. Bell, Fields Superintendent, Department of Agriculture, Auckland.

22 October—"Wool Preparation", by H. G. Mowbray, Sheep and Wool Instructor, Department of Agriculture, Auckland.

29 October—"Farm Safety", by J. L. Doutre, Machinery Instructor, Department of Agriculture, Auckland.

1XH Hamilton, 12.33 p.m.

12 October—"Leptospirosis", by O. V. Griffiths, Veterinarian, Department of Agriculture, Hamilton.

19 October—"Silage Making Machinery and Facilities", by J. L. Doutre, Machinery Instructor, Department of Agriculture, Hamilton.

1YZ Rotorua, 7.15 p.m.

7 October—"Problems Involved in Summer Cropping", by S. D. Clay, Instructor in Agriculture, Department of Agriculture, Matamata.

21 October—"Control of Minerals and Milkstone", by J. B. Cockerton, Special Inspector, Department of Agriculture, Hamilton.

2XA Wanganui, 8 p.m.

1 October—"For the Country Woman", by Mary MacDonald.

8 October—Farming News.

15 October—"Maintenance of Egg Quality", by B. J. Russell, Poultry Instructor, Department of Agriculture, Wanganui.

22 October—"Club-root Control in Market Gardens", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Palmerston North.

29 October—"Gorse Control", by A. A. Duncan, Instructor in Agriculture, Department of Agriculture, Wanganui.

2XG Gisborne, 8 p.m.

20 October—"Stockowners' Question Time", by E. B. Smythe, Livestock Instructor, Department of Agriculture, Gisborne.

2YZ Napier, 7.10 p.m.

6 October—"Seed Certification", by F. H. Collin, Instructor in Agriculture, Department of Agriculture, Hastings.

20 October—"Spring Management of Bees", by S. Line, Apiary Instructor, Department of Agriculture, Hastings.

2ZA Palmerston North, 12.36 p.m.

12 October—"The Preparation of Wool for Market", by H. A. Turner, Sheep and Wool Instructor, Department of Agriculture, Feilding.

26 October—"Mechanical Aids to Ensiling", by J. O. Brasell, Farm Machinery Instructor, Department of Agriculture, Palmerston North.

3YA Christchurch, 12.20 p.m.

5 October—"Livestock Diseases", by A. C. Howse, Veterinarian, Department of Agriculture, Christchurch.

19 October—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.36 p.m.

5 October—"Seasonal Poultry Notes", by W. R. Kaye, Poultry Instructor, Department of Agriculture, Dunedin.

12 October—"Lamb Management", by R. Buchan, Livestock Instructor, Department of Agriculture, Gore.

19 October—"Agricultural Mapping", by I. R. Falconer, Drainage Instructor, Department of Agriculture, Invercargill.

Regular Sessions

1YA Auckland, Mondays at 12.36 p.m. ("Country Journal", including "Report from Ruakura"), Tuesdays, Wednesdays, Thursdays, and Fridays at 7.45 p.m. ("Country Journal"), Thursdays at 12.33 p.m. ("News for the Farmer").

1XN Whangarei, Mondays at 8 p.m. ("Northland Stock Market Report" followed by "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 12.33 p.m. ("Farm News").

1XH Hamilton, Mondays at 12.36 p.m. ("For the Farmer", excluding first Monday in month and public holidays), Wednesdays at 12.33 p.m. ("Report from Ruakura").

1YZ Rotorua, Wednesdays at 7 p.m. ("Bay of Plenty Journal"), Thursdays at 12.33 p.m ("News for the Farmer").

2YZ Napier, Tuesdays at 7.10 p.m. ("The Hawke's Bay Farmer"), and Thursdays at 12.33 p.m. ("News for the Farmer").

2XG Gisborne, Tuesdays at 8 p.m. ("Farm Session").

2XP New Plymouth, Thursdays at 8 p.m. ("Farm Session").

2XA Wanganui, Mondays at 8 p.m. ("For the Man on the Land"), Tuesdays at 8 p.m. ("Farm Supplement"), and Thursdays at 8 p.m. ("Farm Topics").

2XN Nelson, Thursdays at 8 p.m. ("Nelson Farm Topics").

2ZA Palmerston North, Mondays at 12.36 p.m. ("Country Digest") and Fridays at 8.30 p.m. ("Country Digest", including Feilding stock market report).

2YA Wellington, Mondays, Tuesdays, and Fridays at 7.10 p.m. ("Farm Session"), Thursdays at 12.33 p.m. ("News for the Farmer").

3YA Christchurch, Mondays at 12.20 p.m. ("Country Session"), Thursdays at 12.33 p.m. ("News for the Farmer") and 7.10 p.m. ("Home Paddock").

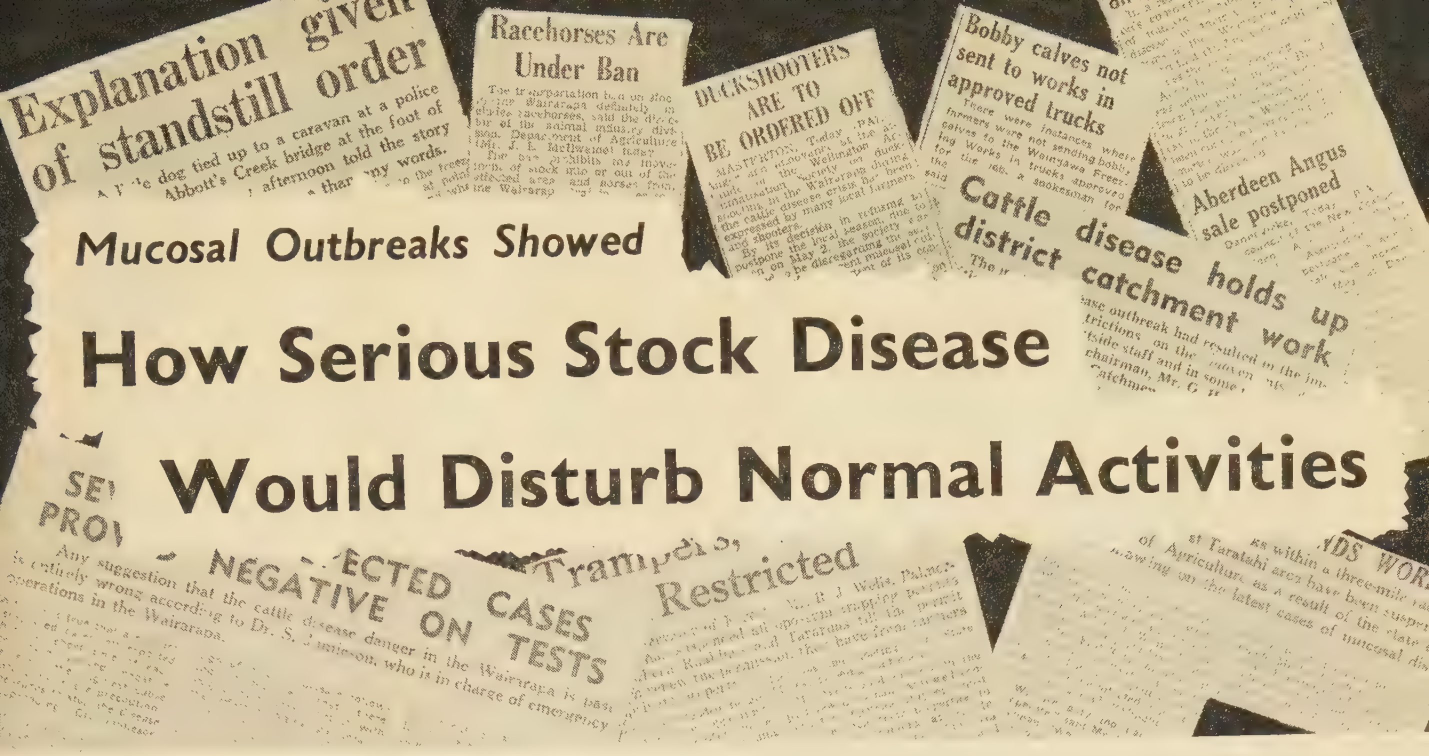
3XC Timaru, Wednesdays at 8 p.m. ("Farmers' Weekly News Service") and Saturdays at 10.30 a.m. ("Country Mailbag").

3YZ Greymouth, Mondays at 12.36 p.m. ("Farm Session") and Thursdays at 12.33 p.m. ("News for the Farmer").

4YA Dunedin, Mondays at 12.36 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m. ('News for the Farmer").

4YZ Invercargill, Mondays at 12.36 p.m. Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m. ("News for the Farmer").

Mucosal Outbreaks Showed How Serious Stock Disease Would Disturb Normal Activities



Explanation given of standstill order

Racehorses Are Under Ban

DUCKSHOOTERS ARE TO BE ORDERED OFF

Bobby calves not sent to works in approved trucks

Aberdeen Angus sale postponed

Cattle disease holds up district catchment work

NEGATIVE ON TESTS

Restricted

CONTROL of mucosal disease in the Wairarapa (and later at Waipukurau and at Palmerston in the South Island) in the early part of this year was a new and salutary experience for farmers and the Department of Agriculture. Stringent precautions affecting the movements of stock and people on a scale unprecedented in New Zealand but familiar in other countries where virulent livestock diseases occur were taken by the Department of Agriculture when sudden deaths of young cattle occurred on several properties.

LESS rigorous measures were considered adequate when more was known of the nature of the type of mucosal disease that caused the trouble, but in the meantime the Department, farmers, and the public had had experience of the paralysing effect of the restrictions that would be necessary in controlling and eradicating one of the serious stock diseases that have until now been kept at bay, but the threat of which has increased steadily in recent years.

One of the greatest problems for farmers—and many other people—was to know what to do and what not to do.

A farmer who for perhaps 20 years had been drawing replacements for his town supply herd from a run-off property some miles away realised that he might no longer be able to transfer those stock. Another farmer who had agreed to buy store lambs from an outside district found that he might not be allowed to take delivery. How did he stand over this failure to fulfil his undertaking?

The owner of land who allowed a golf club to use part of it suddenly realised that visitors could spread disease to his stock. Was he to serve notice on the club? Were the circumstances sufficiently serious to warrant this?

An old lady who for years had taken apples from her farm to a married daughter in a town in another district heard there was a ban on the movement of certain produce. Would this apply in her instance?

These few examples illustrate how people came to realise that their normal existence had suddenly become complicated and restricted. None of them had had to face up to anything of this sort before.

Release of Information

As further outbreaks occurred in the Wairarapa and restrictions were tightened repercussions on individuals or organisations became correspondingly more complex. Disease control measures therefore had not only to be developed and applied to meet the worsening situation, but the public cooperation essential to successful operation of the controls had to be insured by rapid release of reliable information. Because of the exceptional circumstances the Department of Agriculture attached a publicity officer to the control organisation to help to maintain the fullest possible flow of information through normal news sources.

Technical officers under considerable pressure in dealing with control measures in a rapidly changing situation have very little time for giving information. The information officer was able to work with them and with newspaper and radio reporters so that the time of both groups was saved. Direct access to technical officers was provided at times that involved least interference with the urgent work of disease control. The arrangement enabled the Department to keep in touch with local opinion and circumstances.

Rumours Hampered Control Measures

Aggravating and sometimes damaging rumours were bandied about during the disease outbreak and a concerted effort was made by the Department and Federated Farmers to scotch them promptly. The number of infected stock was freely quoted at a preposterous figure and other fabrications which could have been quite damaging to control procedures were circulated. Countering rumours became a difficult but essential part of public relations activities, but rumourmongering did seem to abate after farming leaders and officers of the Department had appealed to people not to listen to or spread them. Keeping rumour at bay is valuable assistance which anyone can give in such an emergency.

The mucosal disease situation with which the Department of Agriculture

Control Affects Many People

STOCK CONTROL AREA
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INFECTED PLACE
Absolutely
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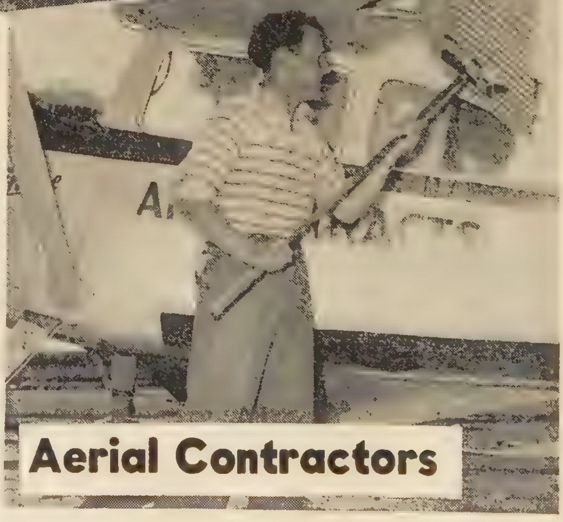
AGRICULTURE
STOCK ACT 1908
Farmers
STOP
ERADICATE
CATTLE DISEASE
Motorists
NO
ADMITTANCE
Transport Operators


Aerial Contractors

FARMERS: Restrictions on movement of people, stock, and goods.

POLICE: Control of entry and exit of vehicles from control area.

MOTORISTS: Subject to disinfection procedure in certain areas. Prohibited from some roads.

TRANSPORT OPERATORS: Movements restricted. Disinfection of trucks required in certain instances.

AERIAL CONTRACTORS: Suspension of operations in controlled area. Disinfection of aircraft leaving it.

Photographs, except those at upper left and second on the right, by Times-Age.

had to deal might on the early evidence have proved far more serious than subsequently transpired. It was understandable that farmers and business people should become seriously perturbed, but much unnecessary apprehension was undoubtedly attributable to rumours.

Experience during the mucosal outbreak showed how important an efficient information service could be in control of any future outbreak of serious disease. Communities which do not understand what is happening or feel that they are not being told will not develop workable solutions for living with a disease problem that imposes considerable restriction of normal business and social activity.

The Department of Agriculture has been able to capitalise on its experience with mucosal disease by incorporating lessons learnt during the outbreaks in plans for the control of other serious diseases should they occur.

Widespread Repercussion

In country areas restrictions on farming affect the livelihood of many people, far more than those who work on farms or otherwise assist farmers directly.

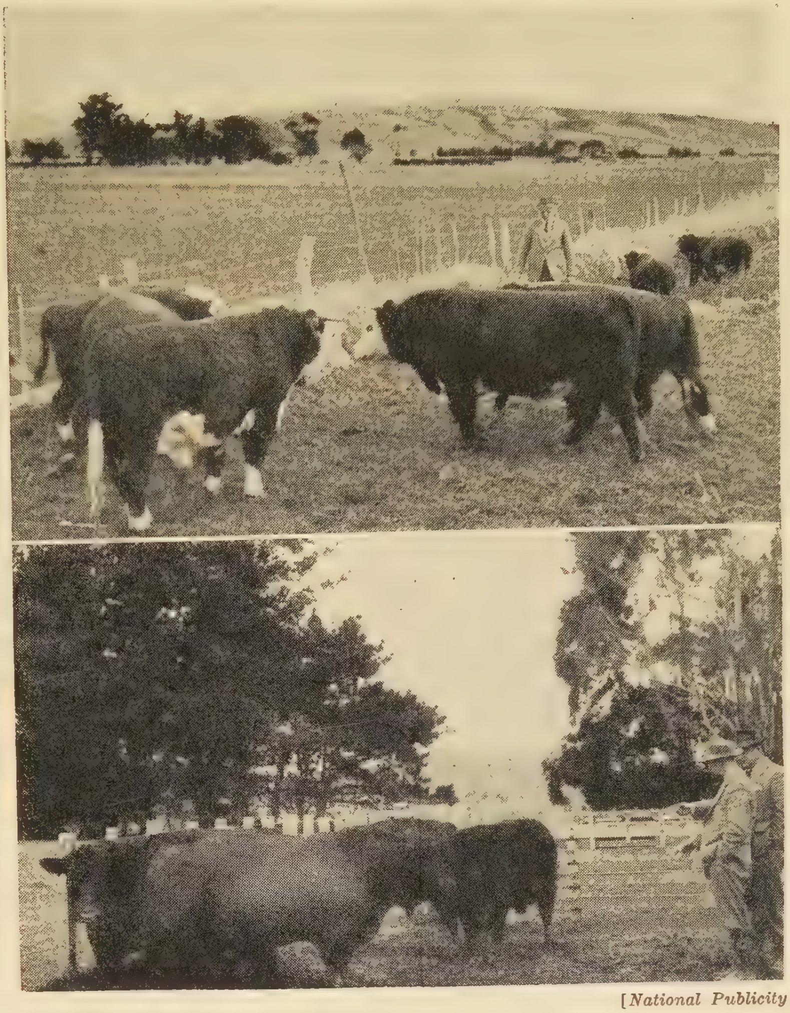
Controls bring widespread repercussions: first on farmers, and ancillary services such as stock and station agents and transport and aerial operators; then on practically all firms in country centres and local authorities such as drainage boards and county councils; and eventually on virtually everyone in the affected area and some outside it.

It was necessary in the Wairarapa, for example, to suspend stock sales, herd testing, aerial topdressing, weed spraying, and similar activities. Farm visits by Department of Agriculture extension officers, stock and station agents, and representatives of various commercial organisations ceased. Droving was stopped. Social visiting to even uninfected farms was voluntarily reduced to the minimum and other community activities in country areas stopped.

The Department of Agriculture laid down a disinfection procedure which enabled necessary services to be maintained even on infected areas. From experience with the mucosal disease outbreaks it should be possible in any future similar situation to give all people within any affected area an early indication of the degree to which they are likely to be restricted.

There was excellent cooperation from farmers, businesses closely connected with farming, and local bodies. In fact some people voluntarily restricted their activities far beyond the extent deemed adequate. The Department of Agriculture had on several occasions to point out that if any activity, business or social, could be carried on safely, to stop it would only impose further undue stress.

Business as Usual



[*National Publicity*

WITH a return to normal conditions in the Wairarapa the reputation of its cattle and sheep continues to draw buyers from all parts of New Zealand. Among them is the Land Development Branch of the Department of Lands and Survey. The illustrations show beef bulls being selected on farms near Masterton by a field officer of the Department's Rotorua office. The Department bought its usual annual quota of bulls from the Wairarapa and officers will return later this year to select rams.

Firms who normally dealt directly with farmers might have to stop visiting the properties, but, the Department suggested, most of this business could be carried on by telephone or letter. Holding a football match on a ground on which stock were or had been grazed was obviously undesirable, but there was no justification for stopping matches on public playing fields used for sport only in town areas.

Control Procedure

An outline of the procedure to control mucosal disease might best indicate to farmers and the general public outside areas that were affected by the recent outbreaks what might be necessary in the control of diseases that could affect them more closely and personally in future.

The first step in control was to apply strict quarantine to the infected properties and to slaughter infected cattle, conduct post-mortem examinations, take specimens for laboratory use, and bury the carcasses.

CONTROL OF SERIOUS STOCK DISEASE . . .

Gates on infected properties were padlocked; the movement of persons, stock, or goods off the property was prevented; a disinfected straw mat was placed at the farm entrance outside the gate; and notices prohibiting entry of unauthorised persons were posted at this gate and elsewhere on the farm. Similar notices were also set up on roads leading to the farm.

The entrance to an infected property was patrolled continuously by officers of the Department. Members of the farm staff were not allowed to leave and the only persons authorised to come on to the property were subjected to a strict disinfection procedure before they were permitted to leave. Full details were kept of the movements of all such official visits.

Tracing Contacts

The first step after the quarantining of the farm where the disease had occurred was to trace previous contacts from the infected farm: people, stock, or goods.

In tracing contacts the Livestock Instructor had to depend mainly on what the farmer and his family were able to remember. Understandably the property owner was somewhat bewildered and could not recall all the useful information at once; in fact, information was often supplemented over three or four days after the initial interview.

The farm on which the disease occurred was designated an "Infected Property" or I.P. and given a serial number, such as I.P.6, in order of occurrence.

From the contacts check the Livestock Instructor was able to assess which properties in the locality or outside the Wairarapa (or Waipukurau) area had to be considered as suspect if there were any possibility of spread of the disease by personal or animal contacts with affected farms. Such properties were known as "Infected Area" farms and what were known as I.A. notices were served on the owners and signs were posted. No movement of stock or farm goods was permitted from such properties and people living on them were requested to disinfect their footwear before leaving their farms and not to take working clothes off the property.

In addition an "Infected Area" was declared covering all properties within a fairly wide radius of the Infected Property.

How Staff Operated

Officers concerned with control of the disease, having first quarantined the infected property and listed the contacts, served I.A. notices and erected signs on farms in the infected area. At the same time, where possible, they inspected and tallied the stock on each farm.

Contact Farms Outside Infected Area

Some farms having contact with the infected property were outside the infected area, a few in several districts far removed from the Wairarapa. I.A. notices were served on these farms by local officers of the Department and in the Wairarapa and Central Hawke's Bay by control officers.

Standstill Area

After three outbreaks had occurred in the Wairarapa a "Standstill Area" or "Stock Control Area" of 2,400 square miles stretching from just north of Eketahuna to Palliser Bay was declared. Police check points were established to control entry or exit. No stock was allowed in or out.

Movement within Standstill Area

Stock movement within the standstill area was not limited, except on infected area farms.

Movement of Stock on I.A. Farms

No stock could be moved on to an infected area property. Stock could be sent off for slaughter at meatworks, and in special circumstances they could be moved, such as across a road to another part of the farm.

For either of these purposes a permit had to be obtained and this was issued after an inspection by an officer of the Department.

Procedure Amended

The procedure described above operated until it became clear that the disease was less of a threat than was at first feared. Later—at Martinborough and Palmerston, Otago—quarantine was applied only to the infected farms and to cattle only. This will be the policy with any future cases of mucosal disease.

However, with more serious stock diseases, restrictions of the earlier, stringent form might have to be repeated.

Support for Department

Excellent support was given the Department of Agriculture throughout the districts affected by the mucosal disease control measures by Federated Farmers, local bodies, and other organisations. Assistance sought was always readily provided and in fact farmers and others took over some activities, which freed Livestock Instructors for their special duties. In other instances volunteers did the physical work, leaving Instructors to supervise only.

Such cooperation not only lightened the pressure on Departmental officers but enabled key staff to concentrate on duties to which they had to give personal attention. Just as valuable was the generally helpful attitude of farmers to officers during the routine visits to farms in the infected areas.

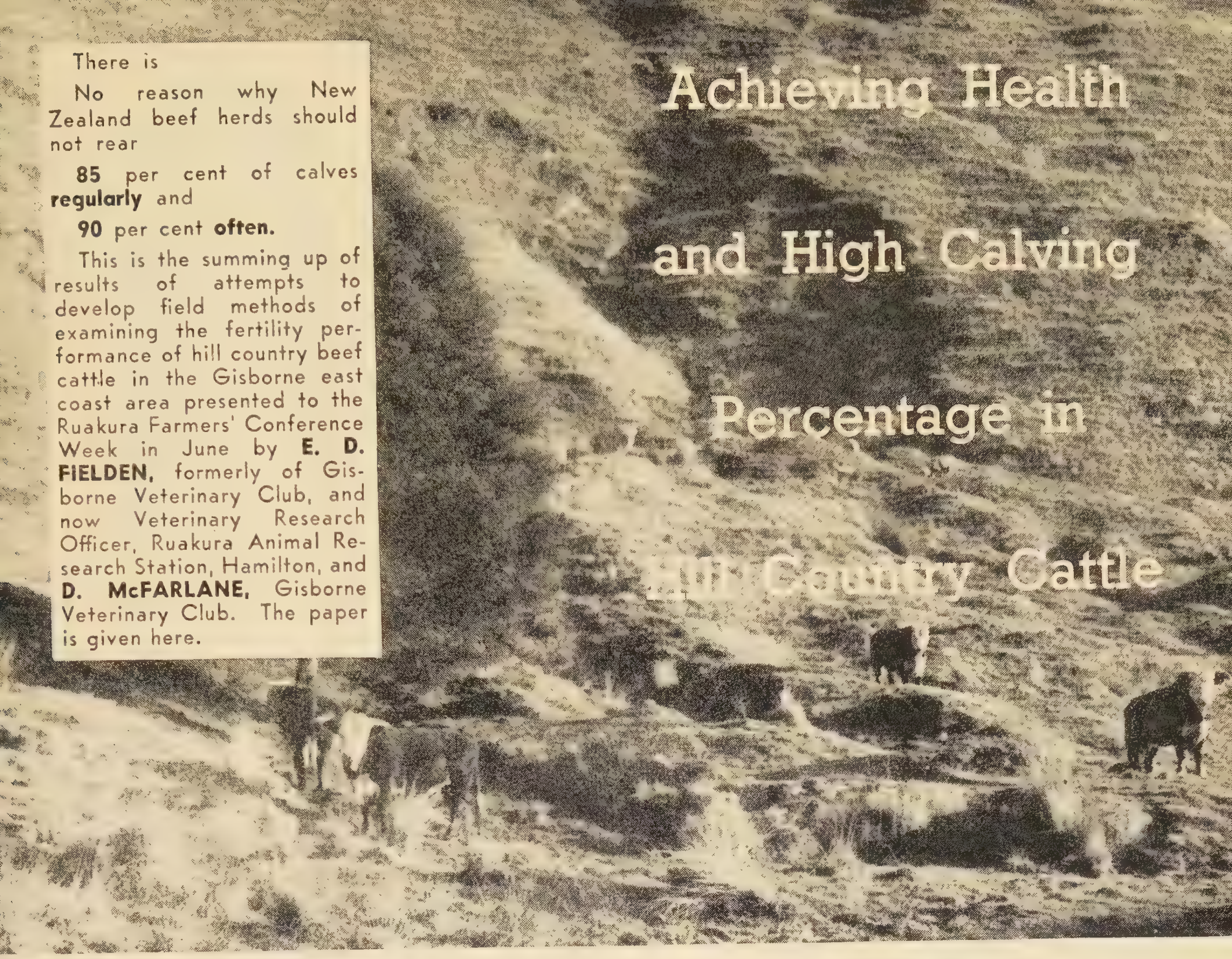
Confidence from First-hand Experience

The stringent measures taken in other countries to control some livestock diseases have been described in articles and shown in films here, but this publicity does not really give farmers a foretaste of what is involved. Until early this year New Zealand farmers had had no real "conditioning" in the practical effects of control measures. They owe a great deal to those who were the first to be subjected to them.

Meteorological Records for July

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit): Approx. mean	Air temperatures: Difference from normal	Absolute maximum and minimum: Maximum	Absolute maximum and minimum: Minimum	Rainfall in inches: Total fall	No. of days of rain	Difference from normal	Maximum fall: Amount	Maximum fall: Date	Bright sunshine hours
Kerikeri	240	51.5	+ 1.0	69.0	33.3	8.40	13	+ 1.01	2.19	25	128
Auckland	160	51.7	+ 0.3	63.5	39.0	6.43	22	+ 0.97	1.83	26	160
Tauranga	12	48.1	— 0.6	64.1	30.0	6.77	11	+ 1.73	3.81	26	148
Ruakura	131	46.9	+ 0.4	63.4	25.5	4.29	20	— 0.44	0.96	26	106
Whakarewarewa ..	1,006	44.7	+ 0.4	60.4	27.8	2.96	12	— 1.87	0.95	26	118
Gisborne	14	47.8	+ 0.1	65.9	27.6	6.32	14	+ 1.91	2.35	26	154
New Plymouth ..	160	49.7	+ 0.8	59.9	35.3	3.55	17	— 2.81	1.00	9	112
Karioi	2,125	40.2	— 0.2	53.4	21.9	3.73	13	— 0.46	0.90	28	
Napier	5	48.0	+ 0.7	66.0	30.8	3.25	13	— 0.18	1.30	26	146
Wanganui	72	47.5	— 0.1	63.0	32.2	1.90	8	— 1.02	0.57	5	121
Palmerston North ..	110	46.4	+ 0.3	60.5	28.0	1.81	17	— 1.23	0.42	5	83
Waingawa	340	44.4	— 0.1	63.1	26.0	2.87	11	— 1.07	0.72	26	138
Wellington	415	48.0	+ 1.7	61.0	36.6	2.62	12	— 2.74	0.77	9	140
Nelson airfield ..	5	43.5	+ 0.2	61.1	26.0	2.43	7	— 0.80	1.34	8	175
Blenheim	12	46.1	+ 2.0	63.8	28.2	4.16	10	+ 1.55	1.18	26	173
Hokitika	15	44.0	+ 0.4	57.9	27.3	5.31	15	— 3.19	1.41	8	116
Hanmer	1,270	39.0	+ 0.5	58.5	20.0	5.20	10	+ 1.00	1.48	25	129
Christchurch ..	22	42.4	+ 0.1	62.1	27.0	2.12	7	— 0.48	0.83	26	159
Ashburton	323	42.4	+ 1.3	64.2	26.0	1.75	9	— 0.87	0.54	26	152
Timaru	56	41.8	+ 0.4	58.2	25.3	1.26	9	— 0.47	0.37	27	130
Alexandra	520	37.4	+ 1.1	60.5	21.0	0.13	4	— 0.53	0.06	19	122
Taieri	80	42.6	+ 1.6	61.6	24.0	0.93	15	— 1.01	0.21	26	101
Invercargill airfield ..	0	42.9	+ 2.4	57.4	26.0	2.48	22	— 0.33	0.52	3	105
Chatham Islands ..	150	44.8	— 0.8	55.4	34.0	2.51	20	— 1.07	0.35	27	

Achieving Health and High Calving Percentage in Hill Country Cattle



There is

No reason why New Zealand beef herds should not rear

85 per cent of calves **regularly** and

90 per cent **often.**

This is the summing up of results of attempts to develop field methods of examining the fertility performance of hill country beef cattle in the Gisborne east coast area presented to the Ruakura Farmers' Conference Week in June by **E. D. FIELDEN,** formerly of Gisborne Veterinary Club, and now Veterinary Research Officer, Ruakura Animal Research Station, Hamilton, and **D. McFARLANE,** Gisborne Veterinary Club. The paper is given here.

Veterinarians Give Findings to Ruakura Farmers' Conference

THE foremost function of any breeding animal is to reproduce its kind, and a high annual calf crop is basic in determining both the degree of selection we can exercise in our herds and the profits we can derive from the saleable surpluses. The costs involved in rearing and maintaining the breeding herd are considerable, and its efficiency as a unit depends entirely on the ability of the individuals in it consistently to incubate and sustain live and vigorous calves. That many herds in New Zealand are not doing this is all too obvious when we consider that from just over one million cows of breeding age only a little over 600,000 weaners are produced each year.

THE extensive nature of hill country farming creates difficulties in supervision of the herd both at mating time and from mating through to calving. This, with the problems involved in handling beef cattle, makes studies of their fertility performance difficult and often hazardous.

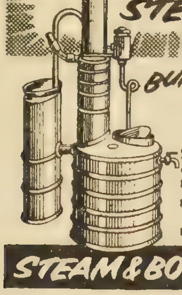
The data presented in this paper are almost entirely drawn from herds examined in the Gisborne east coast area, where we have been trying to develop field methods of examining this situation during the last few years.

The actual extent of the infertility problem in beef cattle must await the carrying out of a properly designed survey; we believe that methods of doing this are now available. Some of the questions which might be asked in such a survey will be obvious from a consideration of the accompanying diagrams. These, while in no way defining the extent of the problem in Poverty Bay, at least give some indication of its nature.

Fig. 1 shows the in-calf performance of some 16,000 cattle by ages over the last six years. This material was all obtained from pregnancy diagnosis data collected during the autumn and early winter. The **in-calf percentage** we define as being:

$$\frac{\text{Number of cows diagnosed in calf} \times 100}{\text{Number of cows mated}}$$

It will be seen that, except for the three year olds, the efficiency at getting in calf increases as the cow matures and there is little fall off in performance until after the eighth year of age. Note the relatively poor performance of the three-year-old



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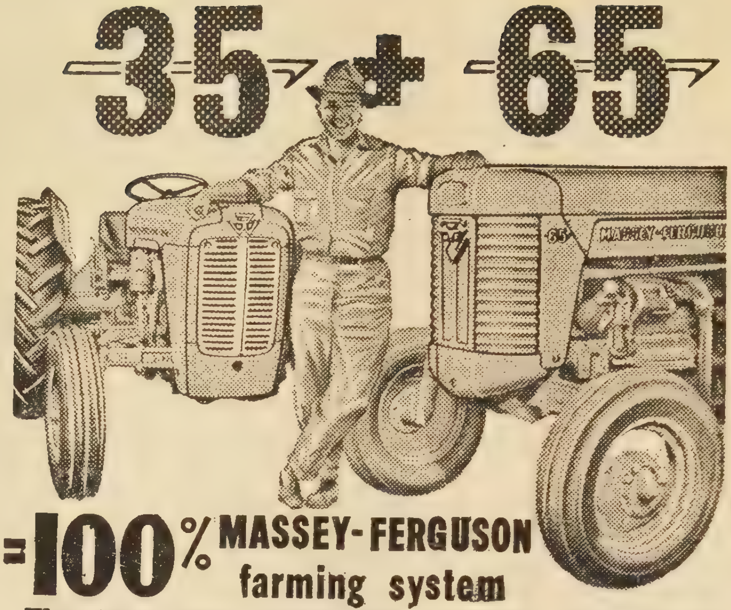

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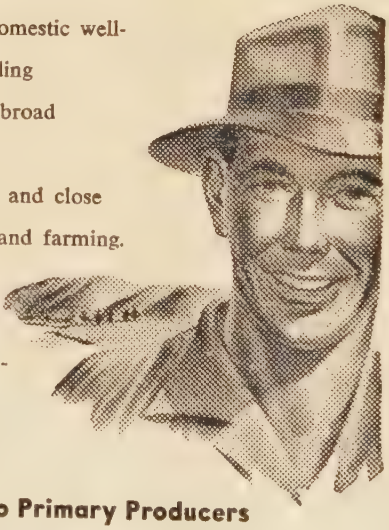

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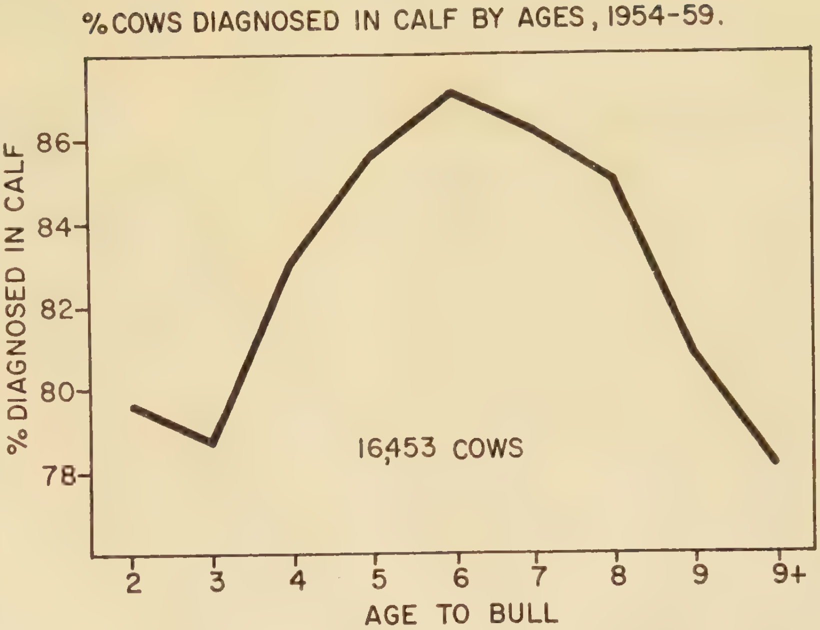


cattle. We have also measured the proportion of late calvers in these various age groups and have found that two, three, and four year olds had 14 per cent of late calvers, while the five, six, seven, and eight year olds had only 11 per cent of late calvers. A late calver we define as a cow which has failed to hold in calf during the first two months that the bulls are out. The number of late calvers has been expressed as a percentage of the cows actually in calf at the time of pregnancy examination.

Fig. 2 involves data collected where whole herds have been examined during the last three years. The general trend is again similar for both poorer and better producing herds, but the degree of fluctuation is much greater in the poorer herds, and the efficiency of the three year olds in them is particularly poor.

Fig. 3 indicates the average age composition of 23 herds in the Gisborne area. The performance of the various age groups from these herds, which is indicated on the top half of the diagram, shows the very important part the young stock play in determining the actual calf crop.

So far we have been talking in terms of the in-calf percentage. What about the number of calves actually marked? This is obviously of much greater interest. This figure we define as the **effective calving percentage** and it is:

$$\frac{\text{Number of calves marked} \times 100}{\text{Number of cows mated}}$$

Mostly it will be very close to the number of calves weaned. The difference between the in-calf percentage and the effective calving percentage on 23 properties examined was about 7 per cent, with a range for the individual properties of 0 to 12 per cent. The reasons for these differences are many and varied and Table 1 indicates at least some of the possible causes.

▲ Fig. 1—In-calf performance of 16,453 cows by ages over the last six years.

Referring back for a moment to Fig. 2 and using this average loss figure of 7 per cent, we see that the poorer herds would have had an estimated average effective calving of 65 per cent, while the better herds would have been about 86 per cent. If we consider the individual herd performance of these herds, the poorest was just under 50 per cent and the best just over 90 per cent in terms of calves marked.

That a variation in calving percentage should exist from property to property or even within the one property from year to year will be nothing new to you; the question, of course, is whether we can find the reasons for such variations, and having found them what can we do about controlling them?

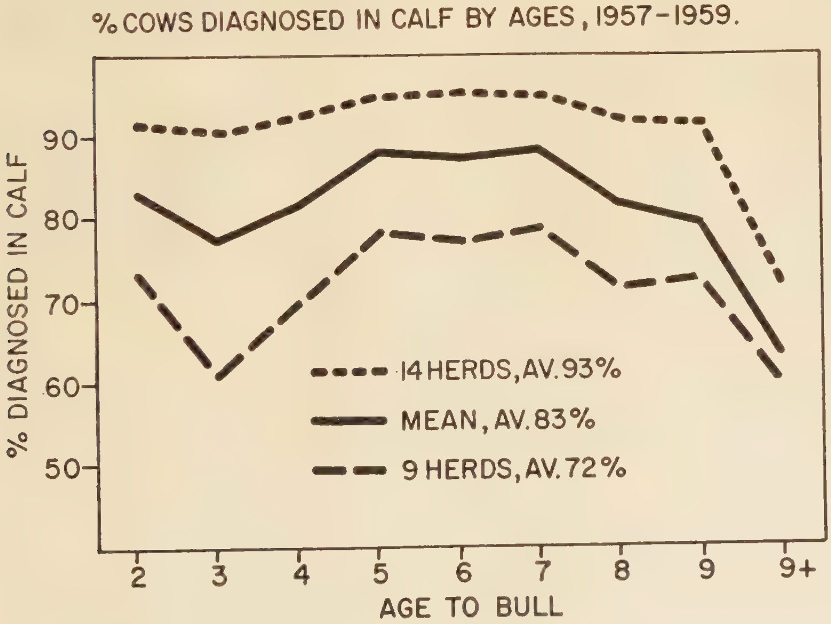
Some of the more obvious factors affecting hill country calving percentage can be most conveniently discussed under the three headings management, breeding, and disease control.

1. Management

Feeding

Reduced food intake has been shown to delay sexual maturity and inhibit oestrus in all mammalian species studied. Crude methods of wintering the breeding herd and inadequate supplies of food for young growing stock, with the demands of early lactation, may impose sufficient stress on

▼ Fig. 2—Data from whole herds examined in the last three years.



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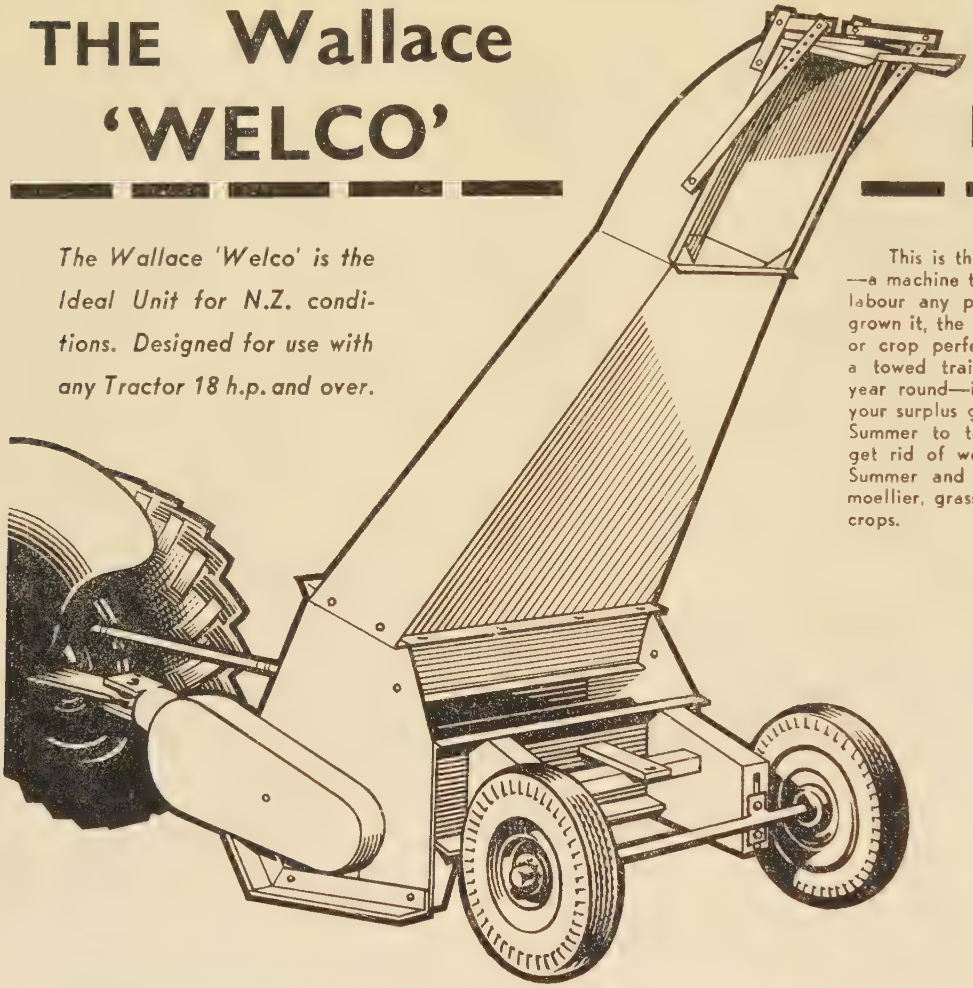

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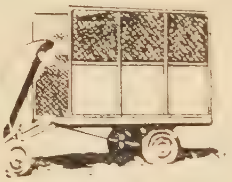

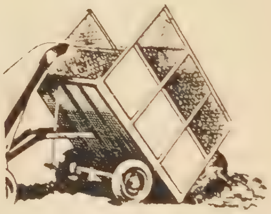

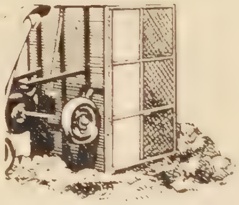

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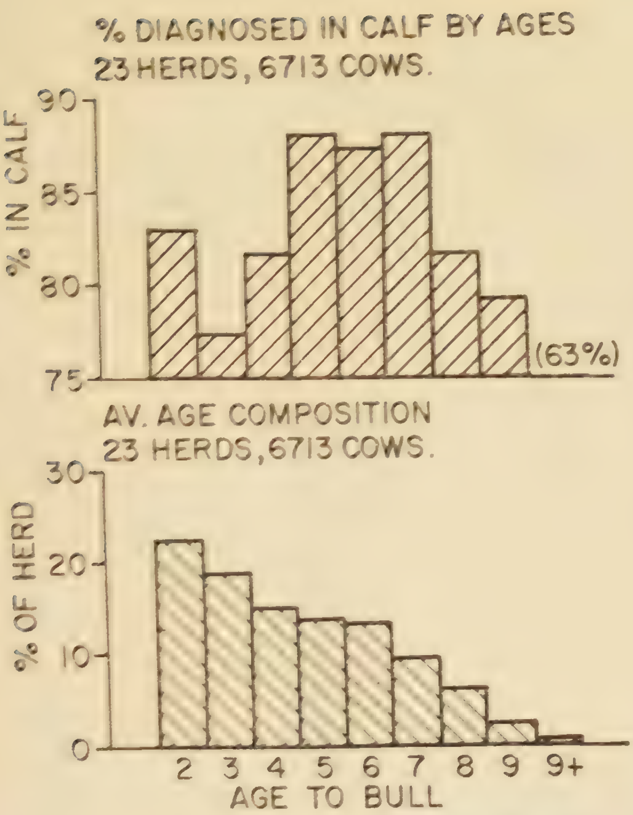


Fig. 3—Average age composition of 21 herds in Gisborne area.

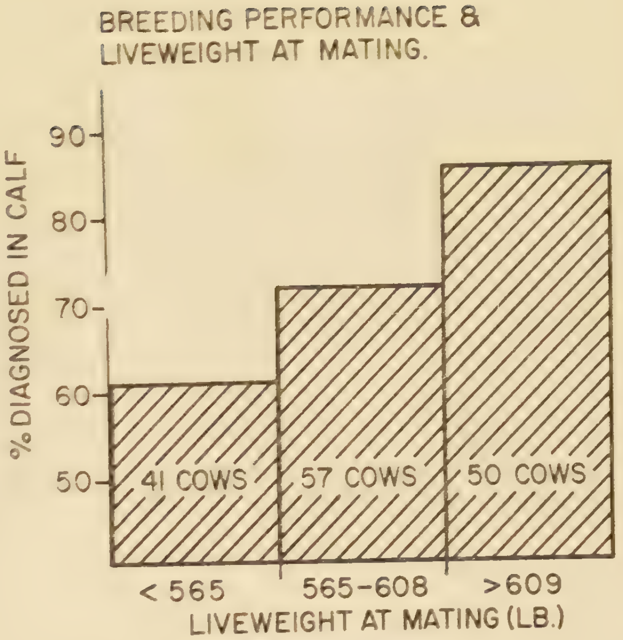


Fig. 4—Trial with two-year-old Aberdeen Angus heifers on an east coast property.

our animals as to result in impaired fertility in the subsequent breeding season.

Feeding for efficient reproduction demands that your heifers should be well grown for mating at least by the age of two years and that these same heifers be given a high level of feeding both when they drop their first calves and throughout their subsequent lactation.

Phosphorus, protein, and vitamin A are other specific food factors which may affect the reproductive capacity of the cow. Whether such deficiencies occur under hill country conditions in this country we do not know.

Size at First Mating

U.S.A. data suggest that a heifer should reach 650 lb liveweight at 20 months to give her best performance.

The heifers in the trial illustrated in Fig. 4 were 2-year-old Aberdeen Angus on an east coast property. They had their body weights assessed from chest girth measurements the day they were put out with the bulls. The performance of these heifers as far as getting in calf was concerned is clearly shown, the implication being, of course, that **heifers should be well grown out at the time of mating.** We suggest that this type of investigation might be fruitfully expanded.

Age when First Mated

We believe that **heifers should be reared sufficiently well to be mated successfully by two years of age on most of our hill country.** Except under exceptional circumstances we doubt the wisdom of mating at three years of age, for, though the effective calving percentage may be higher, the overall calf crop may well be lower than when mating at two years. Table 2 illustrates this point.

TABLE 1—IN-CALF PERCENTAGE

$$\text{In-calf percentage} = \frac{\text{Cows diagnosed in calf} \times 100}{\text{Cows to bull}}$$

Average loss 7 per cent of calves from cows diagnosed in calf

1. Early abortions, early foetal death (trichomoniasis, vibriosis, unknown)
2. Late abortion, calves born dead (brucellosis, leptospirosis, mycotic abortion, difficult calving, unknown)
3. Deaths from birth to calf marking (miscellaneous causes such as under runners, no milk, etc.)
4. Cow deaths*

$$\text{Effective calving percentage} = \frac{\text{number of calves marked} \times 100}{\text{Cows to bull}}$$

* Though cow deaths will affect the effective calving percentage, they have been allowed for and are not included in the average loss figure of 7 per cent. As a general recommendation, if discrepancies of the order of 10 per cent or more exist in your herd, then the situation should be critically examined.

TABLE 2—AGE AT MATING (200 COW HERD, 20 PER CENT TWO YEAR OLDS)

Age to bull	Number mated	Calving per cent	Calf crop
3 ..	160	90	144
2 ..	200	75	150

Age at Culling

There seems little point in culling before the age of nine years; at this stage cows have only just passed the peak of their efficiency.

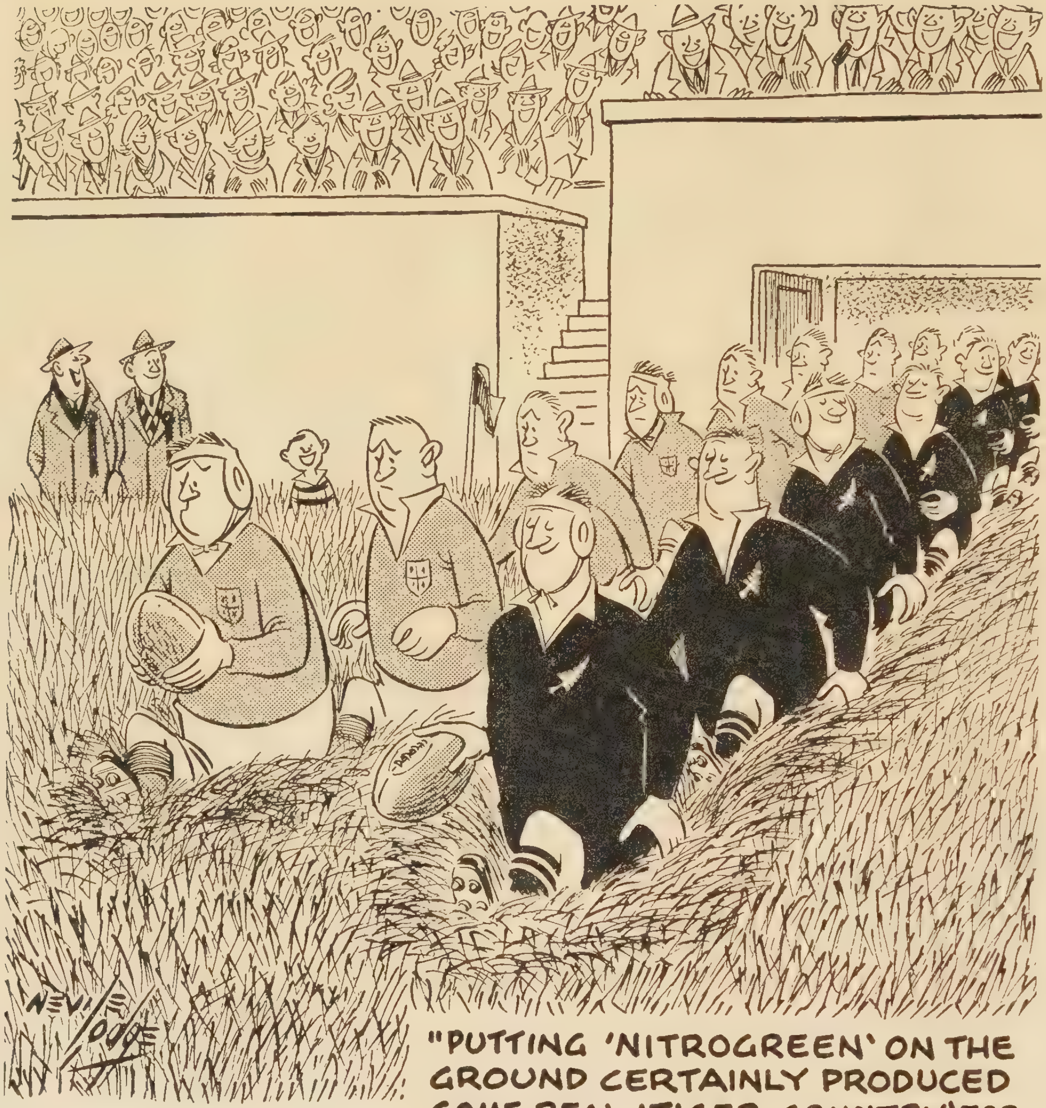
Mating Practice

U.S.A. work indicates that one-bull mating mobs achieve 6 per cent higher calf crops than multiple bull mobs.

If one-bull mobs can be used, it is desirable to switch bulls at least every three weeks to counteract the effect of possible sub-fertile sires.

The cow : bull ratio under extensive mating conditions could stand much closer examination. Where one bull may effectively cover 50 cows in a relatively confined area, his ability to do the same thing under extensive conditions is quite questionable. **This type of problem can be solved on your own property by planned mating trials.**

Age of bulls used for mating: We can only quote American beef cattle



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Sole N.Z. Importers: **HENRY H. YORK & CO. Pty. Ltd.**, Auckland, Wellington, Christchurch studies, where it was found that **higher calf crops were obtained by using bulls up to and including five years of age** than by using bulls over that age.

It seems almost unnecessary to stress that **bulls should be in good health and condition when they are turned out with the herd.** Particular attention should be paid to the condition of the feet. We are not prepared, at this stage, to recommend the widespread use of semen examination by electro-ejaculation before the mating season, as our techniques and understanding of its limitations are, at present, not sufficiently understood to make it a reliable method of assessing male fertility.

A group of cows and calves on the Ruakura Hill Country Station.

2. Breeding

Our only comment is on cross breeding. The more one sees and reads of the first cross animal the more impressed one becomes with such important production features as lower losses, faster growth, larger size, and higher calf crops. **Planned cross breeding** (and we envisage here the triple cross or three breed system) involves management problems certainly, but the results appear so promising that we believe such a system **might be more critically examined by breeders in the industry.**

3. Disease Control

The five infectious diseases which directly affect calving percentage have already been mentioned. An investigation to determine how important a part they play in the herd problem has been started in the Gisborne area, but is still in its infancy. Preliminary results indicate that many of the problems cannot be explained in terms of known disease. This, of course, is already known in certain areas in the dairy industry. The answer to this question would be a most valuable step in determining the course of further fertility studies.

Brucellosis

Commonly known as contagious abortion, brucellosis may cause widespread losses in unvaccinated stock, and it is probably still the most important infectious disease affecting calving percentage in our herds. An increase in effective calving of 8.5 per cent in vaccinated herds was estimated in 1949, when widespread use of Strain 19 vaccine in beef cattle was getting under way in Poverty Bay.

The results of extensive surveys by the New Zealand Dairy Board in the dairy industry have also supported the value of S.19 vaccination in both reducing infertility and preventing abortion.

Vaccination with S.19 is a must, and all potential breeding heifers should be vaccinated, preferably between eight and 12 months of age, but at least three months before being put with the bull.

Leptospirosis

Leptospirosis is another disease which may cause abortion outbreaks, usually in mid or late pregnancy. It does not appear to be very common, but when it does occur losses may be severe. A vaccine is available for protection against this disease if and when you run into trouble; it appears to have given satisfactory results clinically.

Trichomoniasis

Trichomoniasis is a venereal disease transmitted by the infected bull and has been confirmed only once to our knowledge in the Poverty Bay area. Control is difficult under run cattle conditions, but can be achieved by disposal of bulls, sexual rest of the females for at least three months, and the elimination from the herd of any cows that show evidence of foetal mummification or pyometron (pus in the uterus).

Vibriosis

Vibriosis is another venereal disease which is not completely understood and which may be fairly widespread in our beef herds. It classically causes early foetal death; cows end up either not in calf or as late calvers. Abortion about mid pregnancy occasionally occurs. Unfortunately control is exceedingly difficult under run conditions, and at present is probably best attempted by the use of a two-herd system in which virgin heifers and virgin bulls are run as a separate unit.

The importance of vibriosis in beef herds badly needs assessing and the development of an effective vaccine could be of very great value.

Mycotic or Fungal Abortion

Certain species of fungi cause abortion, and such cases have been recorded in New Zealand. They do not appear to constitute a serious problem yet.

We have said nothing of the practice of overmating in relation to the calving percentage. The omission has been deliberate, because overmating by itself contributes little, as far as we know, to the effective calving percentage of the herd. **It does, however, contribute much to the actual calf crop obtained** and is to be commended as a system of achieving this end. In brief, all this system entails is the mating of more breeding stock than it is intended to winter, and the subsequent elimination of dry cattle, and surplus pregnant cows if you have any, by pregnancy diagnosis in autumn.

Finally, because of the very varied nature of our farming environment and because of the very important part this environment plays in the fertility of our stock, it would be presumptuous to pretend we know all the requirements necessary to achieve high calving percentages in our cattle. Nevertheless, with what knowledge we already have at our disposal, and little enough it surely is, we can see no reason why our New Zealand beef herds should not play their full part in our economy and **still be capable of rearing 85 per cent of calves regularly and 90 per cent often.**

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By D. E. K. WALKER,
Principal Scientific Officer, Department of Agriculture Ruakura Animal Research Station, Hamilton

INVESTIGATION of meat production under different systems of stocking with cattle and sheep at Ruakura in the last 10 years has attracted wide attention. The work has been carried out in three stages, each of three years. Results of the first stage were presented at the 1954 Ruakura Farmers' Conference and results of the second stage and a general summing up were given to the 1957 meeting. Since then the third and final stage has been completed and in a paper to the 1959 Conference Miss Walker reviewed the whole investigation.

Stocking Systems

FOR the investigation 150 acres of the fat lamb farm at Ruakura was divided into three comparable 50-acre units.

One of these units has been stocked with four ewes per acre plus approximately ½ cattle beast wintered and fattened throughout the whole nine-year term.

This has represented the "normal" fat lamb farm of the district, and production from this unit has served as a yardstick against which to compare production from other units and has also provided a measure of seasonal differences.

For the first stage one of the other units was stocked with six ewes per acre plus ½ cattle beast bought in in spring and fattened off by autumn.

The third unit carried eight ewes per acre and no cattle.

After three experimental years under these conditions the total area was redivided into three farms in such a way as to equalise carry-over effects on the pastures.

One of the three farms was then stocked with a herd of 30 Aberdeen Angus breeding cows from which five replacement heifers and 12 steer calves for fattening were kept each year, so that with the 12 steers from the previous year 59 head were carried on the 50 acres. Additional cattle were bought in in spring if required.

The other farm was stocked with bullocks. The numbers wintered varied according to the hay supplies and the amount of autumn growth, but on an average 40 were wintered and 20 to 30 bought in in spring.

For the third stage the herd of cows was replaced by fattening heifers, half of those to be wintered being bought in each year as weaners. Additional heifers were bought in in spring when required. At the same time the bullocks were replaced by young steers and the same plan was followed as with the heifers. From these set-ups we now have production figures for

- straight, high pressure fat lamb farming;
- two types of mixed fat lamb and cattle farming; and
- four different types of cattle farming on fattening country.

More Beef Production Possible

When we started on this work in 1949 cattle were of minor importance to the fat lamb farmer. Recent market trends have focused attention on beef and in future some diversion from fat lamb to beef production may be both nationally desirable and privately profitable. The table on page 245 shows that if circumstances warranted it, a change-over to beef production could be achieved without lowering our output of meat.

The production figures are in terms of lamb and/or beef (dressed weight) and allow for carcass increment of store stock, such as yearling cattle.

Production Results

In stage 1 there was obviously no real difference in efficiency of meat output.

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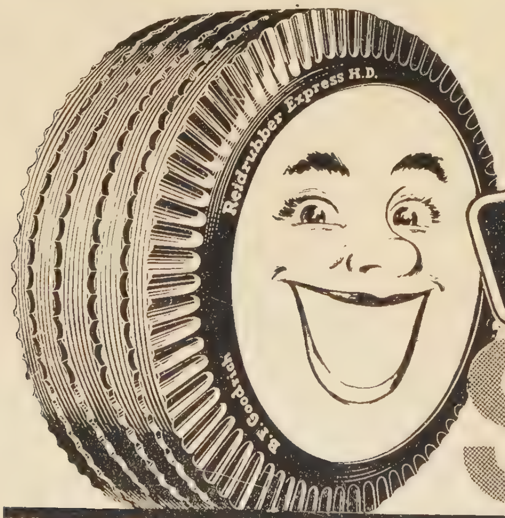
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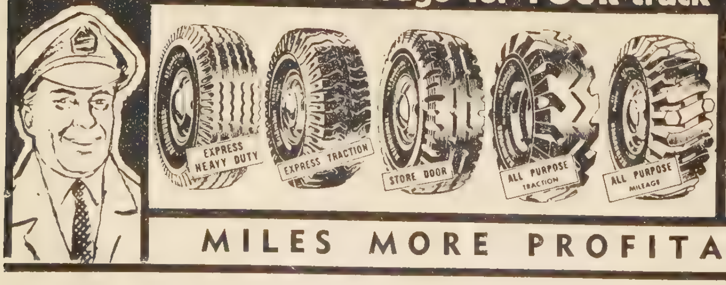
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In stage 2 the production from the 4-ewe farm showed a fall, chiefly due to lower beef production because of poorer hay crops, diversion of hay to ewes during facial eczema danger periods, and harder autumns, so that young cattle could not be bought in until later in the season and their increment over the year was, therefore, lower.

Production from the breeding cows was considerably lower than that from the 4-ewe farm.

We have always emphasised the inefficiency of feed conversion when maintaining the breeding cow on fattening country.

Output from the bullock fattening area was much higher, though the type of meat produced was not very acceptable to our better markets.

Aided by two good seasons, **in stage 3** the production from the 4-ewe farm reached its highest level. Nevertheless production from both the heifer and steer fattening farms was considerably higher.

To compare these seven systems of farming the production from each has been expressed as a percentage of the production from the 4-ewe farm over the same period. These are the figures shown under the heading "relative efficiency".

Breeding cows retain their position as least efficient, while the fattening of cattle, particularly bullocks and steers, is an even more efficient system of meat production than the standard 4-ewe-and-cattle approach. Though the bullocks have the advantage in weight of meat produced, the steers have the advantage of quality.

Wool production, of course, is an important sideline on the sheep farms and this is almost directly proportionate to the number of ewes carried.

Profitability

As in any business, many other factors have to be taken into account beside output. In fact, most people seem to be far more interested in certain of these other angles.

Firstly, there is the burning question of profitability. It is hard to give an answer to this one and I am most reluctant even to attempt it for several reasons. In the first place profitability figures of products whose price levels fluctuate and interrelate as much as those of lamb, wool, beef, and replacement stock can refer only to the past and I don't think anyone wants to know these figures for purely historical reasons. Probably most of the interest has a more commercial background, and that brings up the second difficulty, which is that we didn't have a commercial outlook when we planned this work, but were more interested in finding production facts.

TABLE I—MEAN MEAT PRODUCTION PER ACRE (LB)

	8 ewes per acre	6 ewes per acre + spring cattle	4 ewes per acre + cattle wintered	Breeding cows and offspring	Bullocks	Heifers	Steers
Stage 1	254	259	259				
Stage 2			230	217	255		
Stage 3			263			279	288
Relative efficiency ..	98	100	100	94	111	105	110

To avoid any subjective judgments as far as possible, some techniques were standardised in ways which would not be followed by any farmer interested in profitability. For example, though we always bought good-quality ewes, we ran a flying flock, whereas most farmers would probably have kept at least two-thirds each year with consequent lower replacement costs. It was simpler to do this

DIFFERENT STOCK ~ SAME MANAGEMENT.

Miss Walker discussing the meat → production per acre investigation during the field day at the Farmers' Conference.

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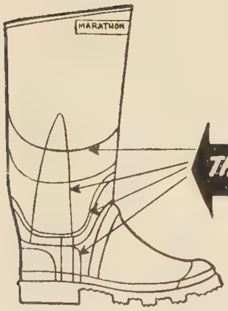

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than to set a culling standard which was safe from personal bias. Again all beef was sold at schedule rates, partly because we wanted the cattle killed when and where we wished, so that we could get carcass weights and other data, and partly because we didn't care to play the local market, where chance can greatly affect the returns. I don't think many local farmers systematically follow this approach.

Other factors — some personal management factors and some seasonal factors—affect profitability. Lambing percentages and lamb weights, the presentation of the wool clip, and the luck of the wool sales will affect the returns from sheep. Calving percentages, the margin between buying and selling prices, the numbers of cattle fattened, and the time of the year when they are fattened all materially influence cattle profits.

Above all this the running costs of the farm concerned must be taken into account. However, the issue will not be dodged completely, and an attempt has been made in Table 2 to show prices as near as possible up-to-date. They refer only to stock and produce and are based on 1958-59 prices, which are already out of date in most cases. As a sop to convention it is assumed that two-thirds of the ewes are retained, but the beef remains firm at schedule prices, because it is difficult to value all the fat cattle in retrospect at even approximate local market prices.

TABLE 2—STOCK FINANCES PER ACRE PER ANNUM AT 1958-59 PRICES (£)

	Outlay	Sales	Stock on hand	Replacements
8 ewes ..	35	33	13	12
6 ewes ..	39	40	10	21
4 ewes ..	29	29	15	10
Cows ..	37	20	33	5
Bullocks ..	51	58	—	51
Heifers ..	40	33	16	23
Steers ..	44	40	19	26

This table covers four of the main financial aspects of alternative methods of livestock farming: the total capital outlay, the gross income, the value of stock on hand, and the cost of annual replacements.

First, it is obvious that the capital outlay per acre in livestock was greater with fattening cattle than with sheep, and was maximal under a bullock fattening system. In practice the actual outlay under any system varies widely with market prices, while even the relative positions of the systems can change radically. For example, this season, with ewes at £2 10s., the 8-ewe farm would show up much more favourably compared with an all-cattle farm than it does in this table.

Gross incomes fluctuated widely, but obviously these mean little in themselves, since they must be considered in relation to the other three columns. Thus the large gross income from fattening bullocks became relatively insignificant when outlay and cost of replacements had to be met. The gross return from breeding cows, in contrast, was largely net. Ewes and young cattle produced comparable gross incomes, but at lower capital and replacement costs.

A realistic allowance for stock on hand is fraught with problems. For example, the high figure for breeding cows merely meant that the initial capital outlay was intact, while with young steers a large proportion of this value was net gain, since the young cattle concerned grew from low-priced weaners to high-priced 18 months' cattle. A fifth column concerning running costs is obviously necessary before a comparison of relative profitability can even be attempted, but such figures would be even more difficult to arrive at, for reasons which every farmer will appreciate.

All the figures given merely emphasise the extreme difficulty of comparing alternative systems of livestock farming on a profit-earning basis in any meaningful way. In practice the farmer has to guess the market trends, take note of his financial resources, and gamble on a system which he hopes will turn out profitably.

Instead of pursuing this angle the article will concentrate on some general comments arising from experience in running these seven systems of farming.

Various Systems Compared

The **8-ewe-per-acre system** can be called "hungry farming", as for a greater part of the year feed is short, the ewes are hungry, and cause worry. Considerable time and thought must be given to management. If this rate of stocking is kept up over a long period, pastures tend to deteriorate and may have to be renewed. Though worms did not cause trouble over the four years of this stocking rate, the worm burden of the lambs did show a gradual increase, and this trend, if continued, might have become serious. I do think, however, if the season was starting well, an occasional year under this type of stocking would benefit the pastures on most farms and, naturally, farmers would not undertake it unless the prospects for lamb and wool prices looked good, so that they could expect to benefit too.

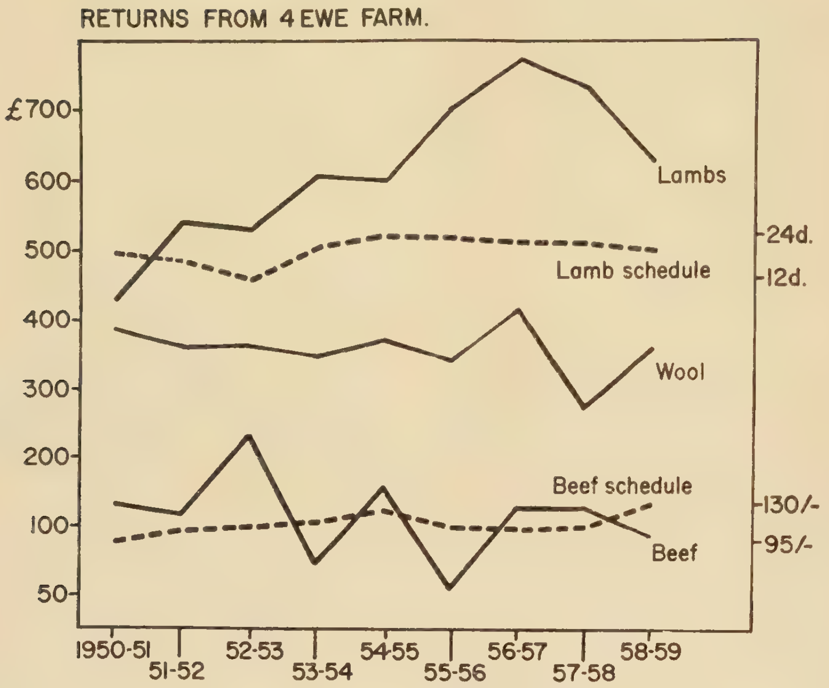
The 6 ewe plus spring cattle system was the easiest involving sheep because the Ruakura area can winter that number without undue hardship when there are no complications with cattle. Cattle were bought in only when there were indications of surplus feed, and they were slaughtered before feed became short. No hay had to be made or fed out. The great drawback was that cattle were bought at high spring prices and were sold when schedule value and market value most nearly approximated, so that it was difficult to make anything out of them.

The 4-ewe farm had more in its favour. First, it had more resilience. Its main output consisted of lamb, wool, and young beef which had grown into profit. All prices seldom fluctuate in the same direction at the same time and average returns were good. Management was relatively easy. When the ewes were tightened up after tupping the calves got first pick. The older cattle wintered well on hay and what grass was available. In the spring they were given preference behind the ewes and lambs, and the younger cattle were by then well enough grown to take second choice. Hay had to be made and fed out, but in no great quantity.

We have never recommended running breeding cows on fully improved country. The overhead cost of maintaining the cows is too great. Apart from that, the amount of capital tied up in stock is high and the annual turnover is relatively low. A high proportion of the stock are mature cattle which cannot "grow into profit" if prices fall. Bulls are an additional source of worry and expense. More classes of stock are on hand, requiring separate paddocks. Hay requirements are fairly high. The per head investment is high, which magnifies losses due to disease or accident.

Though breeding cows are undesirable alone, therefore, their use in conjunction with a fat lamb flock can be justified in some circumstances. For instance, where some land remains to be broken in a herd of cows can assist materially and pay their way. Isolation involving high transport costs is another good reason for breeding as opposed to buying weaners.

The fattening of bullocks was not very arduous and gave no great management problems. A large amount of money must be invested annually and the turnover is small. Anyone practising this type of farming is dependent on local markets for profit, as schedule rates are scaled against heavyweight carcasses. Again, the



mature beast has less chance of coming out profitably if prices fall. Transport costs can be high.

The fattening of heifers I cannot recommend, as it seems wrong to kill good potential breeding stock. Heifers may fatten faster than steers, but they tend to put on less weight and if they are not drafted with discretion, they produce carcasses with very uneven fat distribution. Great fat deposits over the ribs are common, while the necks and buttocks have an unfinished appearance. Management difficulties are mainly associated with sex. In every line of "empty" heifers some are sure to be in calf or to get that way. This was found to be particularly true of extra cattle brought in in spring.

The fattening of steers presented no great difficulties. It involved a slightly greater outlay than for heifers, but the returns were also higher. At present the outlook for beef seems good, while the lamb market is a shade uneasy. If a swing over to beef were warranted, it should be done this way. However, the cattle markets the world over are renowned for their violent fluctuations, and with this type of farming one is always working on margins. When beef prices are high the price of store cattle rises, and though young cattle have the potential of growing into profit, they may have to struggle against falling prices. Lamb prices tend to move more steadily, buffered by wool, which, in turn, affects ewe replacement prices. The accompanying graph indicating the profits from the lamb, wool, and beef of the 4-ewe farm over the nine-year period illustrates these points.

The schedule prices for lamb and beef are shown as dotted lines. The returns do not necessarily follow the schedule trend. A high lambing percentage followed by a good season as in 1956 can send the returns up, even though prices are falling.

The beef graph shows profits; that is, it reflects the margins, and otherwise has been influenced mainly by season. It fluctuates much more wildly.

In view of all these considerations, I would still prefer a mixture of sheep and cattle at least until the market positions are a little more clarified.

Summing up, on a one-man farm I would aim at a ewe flock of up to 1,000 ewes. Whatever else the farm would carry I would use cattle and these, for preference, would be young steers, half being bought in each year as weaners in autumn, because I dislike the thought of losing money on spring purchases, and also because winter feeding of hay can be used to improve pastures. This is assuming a handy farm which is all brought in. If I could afford it or conditions justified it, I would have a breeding herd, because I think it is much more interesting.

Book Review

"Y.F.C. Stock Judging Handbook"

THIS book is published by the New Zealand Federation of Young Farmers' Clubs (Inc.). It is well illustrated and gives the history and a description of individual breeds of dairy, beef, and dual-purpose cattle and all breeds of purebred sheep and the four main breeds of pigs in New Zealand.

The breed societies and breeders' associations have cooperated in making available their standards of excellence.

Information is given on judging fat sheep and lambs and on judging saddle horses, cobs, and ponies.

Organising and conducting stock judging competitions are described and advice given to competitors.

An appendix gives the rules for national stock judging competitions. The book is well planned and should be invaluable to all young farmers and to anyone wishing to obtain authentic information about New Zealand livestock.

—*G.L.W.*

Copies are obtainable from the Dominion Organising Secretary, Federation of Young Farmers' Clubs, P.O. Box 2298, Wellington, for 9s. each (cash with order).

Annual Report of Department of Agriculture

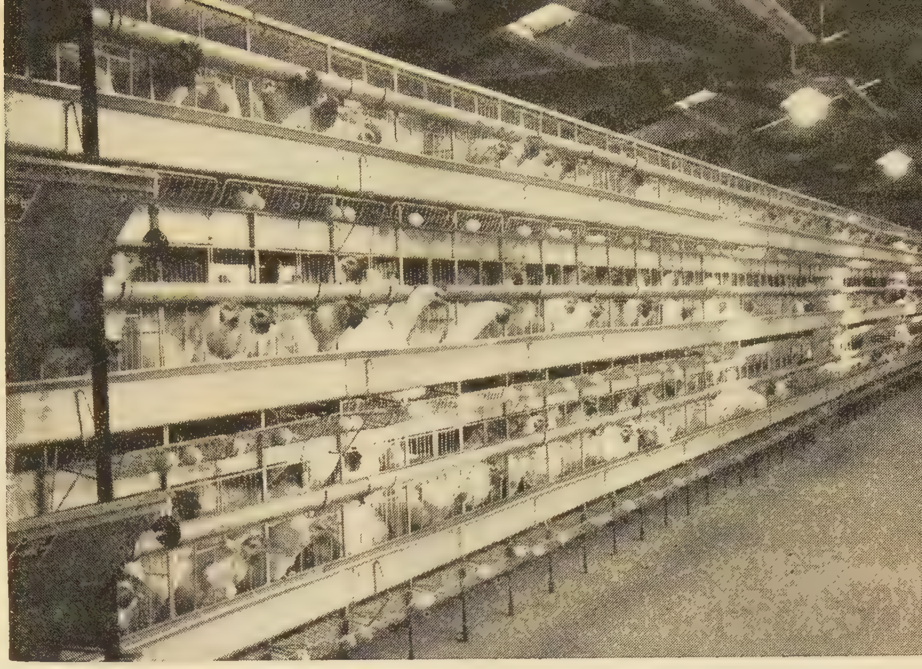
THE Annual Report of the Department of Agriculture for the year ended 31 March 1959, containing reports of the Director-General and Directors of the Animal Industry, Animal Research, Dairy, Extension, and Horticulture Divisions and various industry accounts, may now be ordered from the Publications Section of the Department.

"The Farming Year" section of the report reviews the primary production industry generally and comments on marketing and economic trends and prospects. The Director-General's report deals with the diversification of farming.

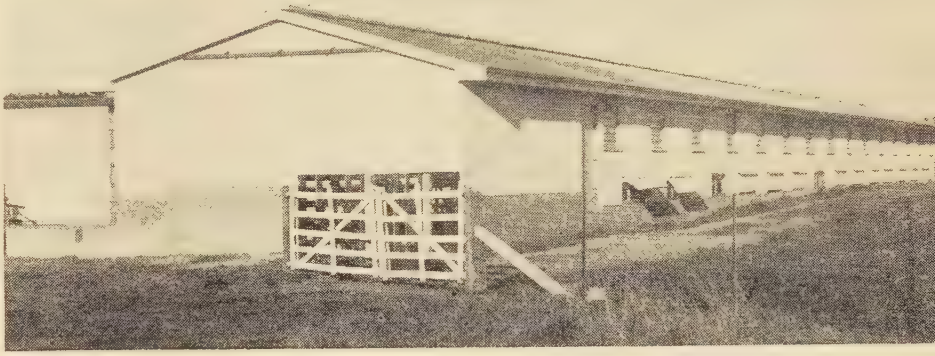
Orders should be sent to the Publications Section, Department of Agriculture, Box 2298, Wellington, or to the Government Printer, Wellington. The price per copy is 6s.

The Annual Report should be of wide interest to all primary producers as a record of the research and extension services of the Department.

THE system of keeping birds in laying cages, or hen batteries as they are known in England, was first introduced into that country in 1925 and has become increasingly popular. Since the war the manufacturers, believed to number more than 50, have, under the pressure of intense competition, improved the design of the cages, making such operations as feeding the birds and cleaning the manure trays and water troughs fully automatic, so leaving the attendant more time for egg collecting and packing, cleaning cages, and other routine work.



Automatic Laying Cage System of Egg Production



▲ Type of housing used for British-type laying cages, showing louvre windows and ventilators at floor level. The flat ridge board gives top ventilation. The interior view at top shows the continuous run of metal mash and water troughs. The hoppers of mash for replenishing the mash troughs are at left.

THREE types of British laying cages are being operated in New Zealand. There is the non-mechanical type more suitable for smaller numbers of birds, the automatic cafeteria system, and a type combining the best features of both designs.

The non-mechanical type has three tiers back to back, is non-powered and fitted with fixed food troughs, hand filled, continuous water troughs or drink nipples, and a hand-operated plough for clearing the manure to the end of the droppings tray.

In all British cages operating in New Zealand this tray is made of sheets of wired plate glass and therefore is impervious to rust and corrosion.

This type of cage is most suitable for the smaller poultry keeper or general farmer, as, being non-mechanical, it can be left unattended for up to 48 hours. Obviously this type of static cage will not suit the commercial egg farmer, as the labour and time involved per bird are excessive.

The automatic cafeteria system was designed to meet the needs of commercial egg producers and a number of units have been imported. As the name cafeteria suggests the food and water troughs, mounted on a steel frame which hangs from rails on top of the cages, move slowly backward and forward along the cages in front of the birds, allowing each bird to eat and drink; at the same time the ploughs scrape the manure along the glass droppings trays into pans at the end of each block. This process, which continues for 14 hours a day without any assistance from the attendant other than daily filling of the feed hoppers and emptying the droppings tins, can reasonably be described as fully automatic.

Though countless thousands of birds are housed in these cafeteria units satisfactorily overseas, practical problems associated with this type of laying battery have to be considered.

(a) Do the birds get sufficient time to eat and drink as the food unit passes along the cages?

By J. H. JONES,
Poultry Instructor,
Department of Agriculture,
Oamaru

(b) What happens if power fails and the birds are without food and water?

(c) How long can the cages be left unattended?

The continuous operation for 14 hours daily of electric motors, gear boxes, pulleys, and wire ropes can in time lead to deterioration of the components. Fouling of the moving feed units by feed tins left in the path of the cafeteria or cleaning utensils such as brooms left leaning against the unit are also risks.

The latest type of laying battery combines the best features of both designs, namely the safety of the static type and the labour saving of the cafeteria system. This improved design is finding favour in New Zealand and a unit on the farm of Mr J. Quested, Georgetown, North Otago, is described and illustrated.

This 3,000-bird plant is now operating successfully in its second season

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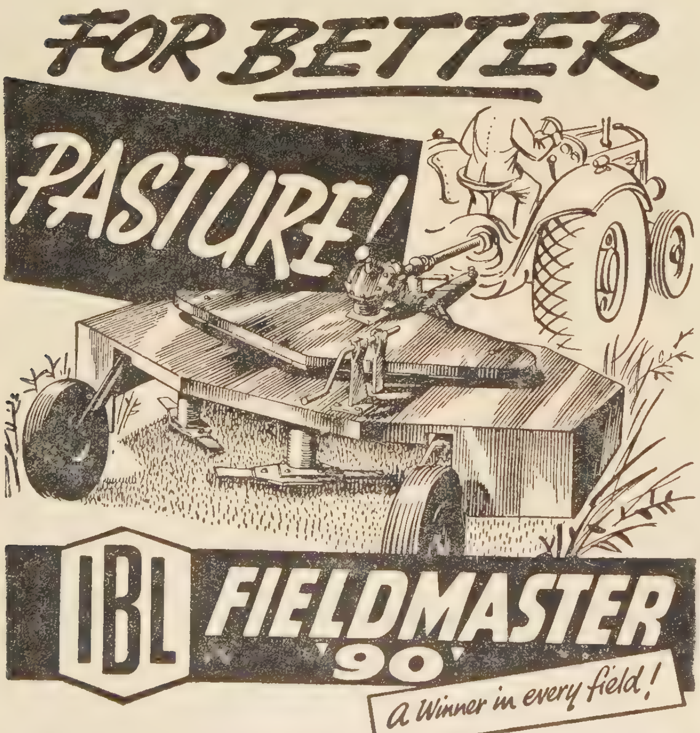

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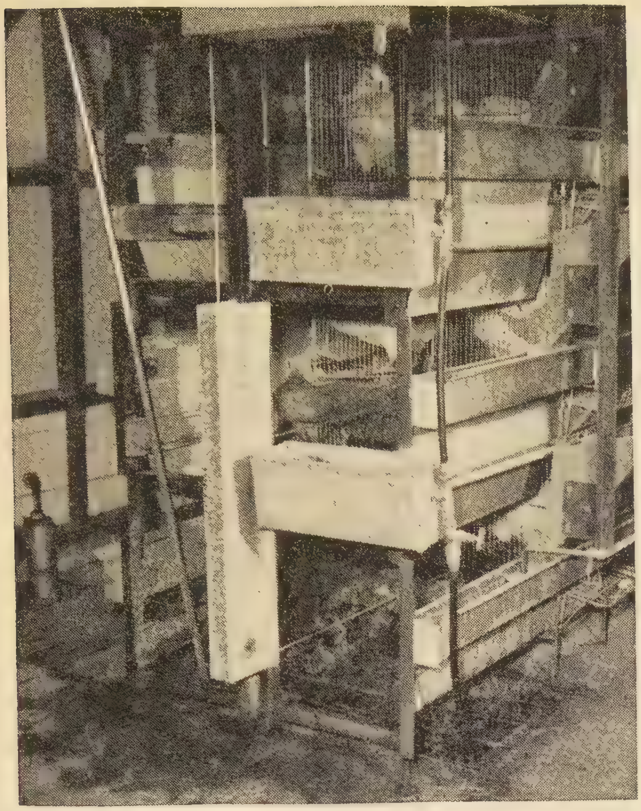
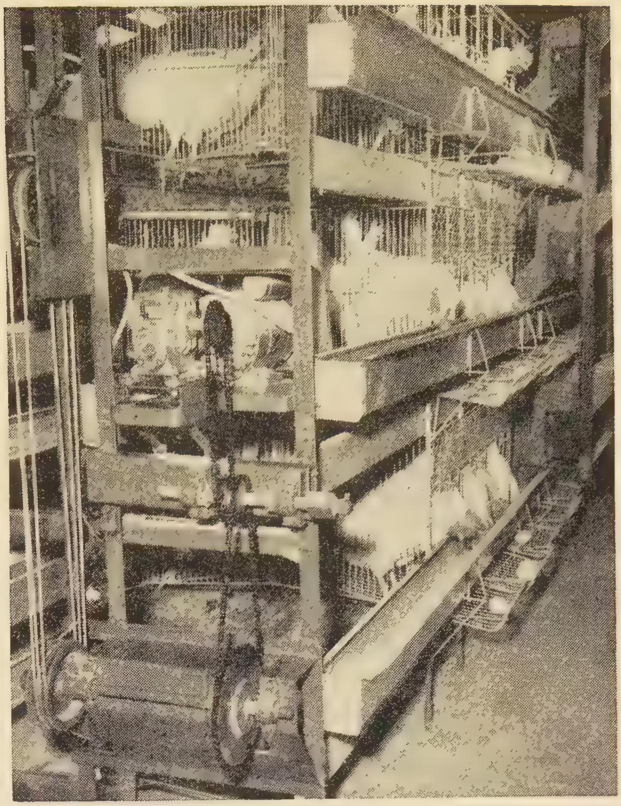


▲ End view of battery cages showing where droppings scraped from the floors under the cages tumble down through a grating in the floor into a sump, with pump outlet on the left near the wall. The long metal pipe sticking out of the sump has a board on the end and is worked like a plunger while manure is being pumped out of the sump.



▲ End section, showing motor and gearing for driving the feeder and scrapers. Provision is made for hand operation in a power failure and the chain mesh guards on the cage fronts prevent birds reaching out and pecking eggs in the row above.

and consists of two blocks of cages, each double sided and 3 tiers high. The end section of the wirework measures 6 ft 6 in. high, 3 ft wide, and with feed troughs and mechanical gearing is 7 ft high and 4 ft 6 in. wide. The overall width of the unit, including travelling feed hoppers, is 5 ft 8 in.

Egg production and overhead costs with two sizes of cages are being compared on this farm. One block consists of 674 cages, each 14 in. wide and 18 in. deep, and holding two birds each. The second block is of 540 cages 18 in. square and containing three birds a cage. Both blocks are about 140 ft long.

The standard drinking troughs supplied by the manufacturers, which are usually situated over the feed troughs, were in this case dispensed with and drinking nipples substituted. These water troughs, which are now more or less standard on all English cages, are favoured in England because they withstand freezing and thawing without damage. The troughs are kept filled by a small tipple tank and the overflow runs via concrete channels in the floor of the cage house to a sump outside. The troughs are cleaned daily by rubber squeegees which fit in the troughs and are attached to the travelling feed hoppers.

As most of the cages are situated in the coastal belt of the South Island where continuous severe frosts are not normally experienced, this modification to the water system appears to be a distinct improvement.

The birds drink from nipples in pipes at the top of the back divisional wall of each tier of cages, the birds of both sides drinking from the same nipple, 4 to 6 birds to a nipple.

A careful check by glass measuring tubes inserted into the water pipe is made to ensure that the head of water over the nipples does not exceed 1 in. to 1½ in. and drips, if any, fall on to the glass droppings tray and help to keep it clean. Proximity of the birds to the water pipe appears to date to have prevented any freezing of the system during winter.

Feeding the Birds

As with the earlier cafeteria system the moving feed unit is retained, except that instead of the birds feeding from it as it passes, this unit, which consists of six large feed hoppers, deposits sufficient feed in the long continuous feed troughs to last the birds for 24 hours. The feed deposited can be controlled according to the appetite of the birds by adjustable slides on the hoppers. The time taken to feed a 140 ft block of cages is about 10 minutes.

Cleaning the Cages

Simultaneously with the feeding unit and from then on automatically and independently at 4-hour intervals the scraper ploughs, consisting of sprung steel blades and following rubber squeegees, scrape the manure to the far end of the cage block, where it is deposited on to a cross conveyer belt and taken out of the building. On Mr Quested's farm the manure enters a water-filled sump 17 ft long, 6 ft deep, and 2 ft wide.

The liquid manure, which requires very little agitation, is pumped out daily by sludge pump to a 400-gallon tank on wheels. This trailer, with a simple spreader, is used by a neighbouring farmer to put the manure on his paddocks. The intake end of the pump must be guarded by a wire screen against the entry of large feathers. The disposal of manure is always a problem on a large unit and liquid spreading appears to be easy and convenient.

Housing the Unit

In housing English laying cages it is well to be guided by British experience.

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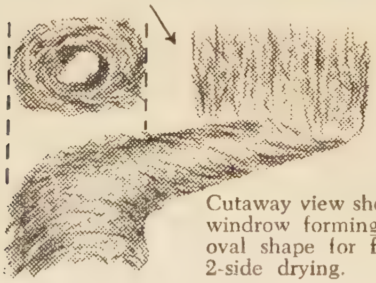

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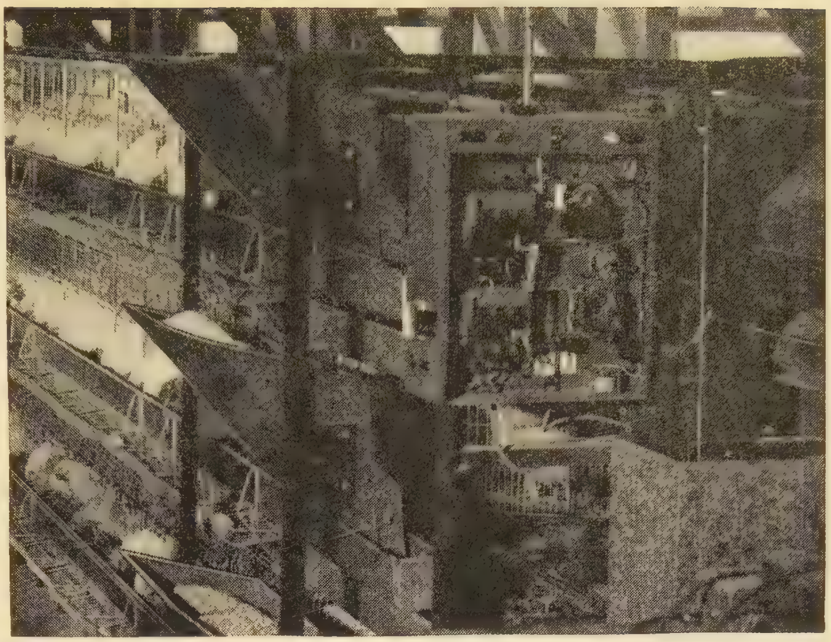
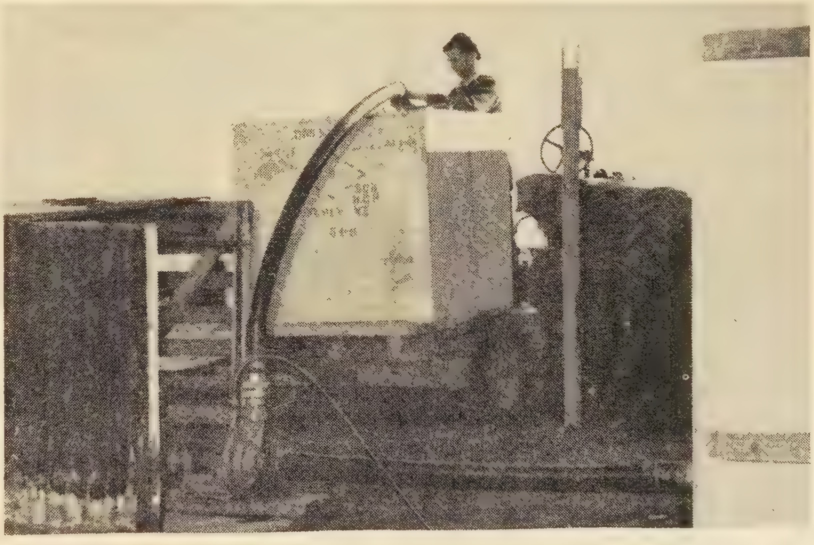


End view of latest-type automatic laying battery showing hoppers containing mash ready to move along and fill the mash troughs. The front of the control panel has been removed to show the unit which operates the feeders and scrapers for two banks of cages in this shed.



Sludge pump driven by a 6 h.p. petrol engine fills a 400-gallon tank through 3 in. alkathene piping with liquid droppings.

The house must be well sited, preferably running north to south to avoid too much sun on one side. There should be good facilities for receiving food from a truck or tractor and for the removal of eggs. Careful consideration must be given to an easy method of disposing of manure. Water and electricity supplies need to be available, and with a large unit good drainage must be provided from drinking troughs if they are used and for rain from the roof.

The house built by Mr Quested to hold 3,000 birds is 170 ft long and 20 ft wide overall, with a 7 ft stud and 10 ft to the ridge of a gable-type roof. The section accommodating the birds and cages is 150 ft with 20 ft at the end, and has a raised wooden platform for storing feed and equipment.

The design and strength of a cage house are most important. The floor must be of concrete and level. The roof must be well tied down and braced to the walls to withstand high winds or sudden gales. The building will ultimately house expensive equipment and valuable birds, probably the farmer's entire source of income, and this should be borne in mind in planning its construction and during the work of building.

With a concentration of one bird to every square foot of the building, it is obvious that the construction of a cheap and temporary house would be most unwise. The design must ensure the maximum comfort of the birds at all the year and in all weathers.

Ventilation of a laying cage house can make or mar conditions otherwise suited for high egg production. The side windows must be large and low enough to give light to the lowest tier of cages and it should be possible to open them wide in hot weather. Mr Quested has used the louvre type.

Air should also be taken in through controlled inlets at floor level and out from the ridge either by fixed cowls, electric extraction fans, or by a continuous opening at the ridge covered by a flat ridge board.

Roof lights are also needed to light the cages facing the centre and as well artificial lights can be used profitably in winter.

In construction of the roof the use of prefabricated trusses which eliminate a centre ridge board and so improve ventilation is strongly advised. Sarking under the iron of wood, wood-pulp wallboard, or one of the non-conducting paper types now available is recommended. In the house illustrated roller blinds fitted under the central roof lights are effectively used to reduce temperature in summer.

Though the roof of the house is not sarked, Mr Quested says that if he built another house of this type he would use sarking under the iron roof.

Experience has shown, however, that even on a hot day if all windows, floor vents, and double doors at each end are opened the temperature of the house can be reduced considerably. This battery cage house is the coolest place on the farm in summer, the mechanically cooled egg storage room excepted, and in winter the warmest, because of the efficiency of the louvre windows and controllable ventilators.

The British-type automatic laying cage described houses a 3,000-bird laying flock and is being operated single-handed by the farmer plus the work of rearing replacements for the unit.

The question arises as to how many birds could be handled by a man using the fully automatic type of cage. It is reported from America, where British cages are in use, that with no replacements to rear one man can look after up to 30,000 birds per day.

All photos by Max Smyth.

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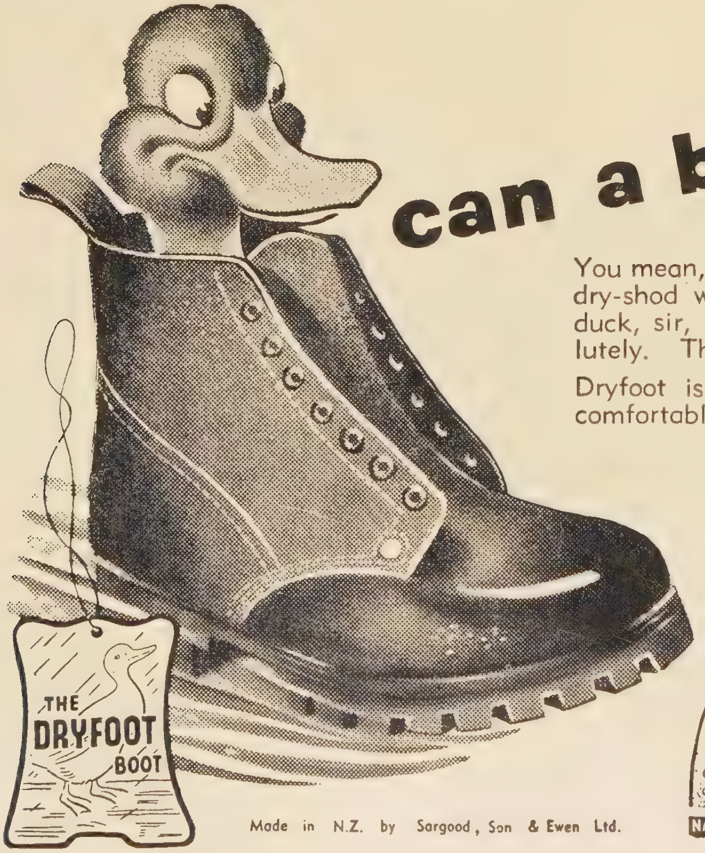

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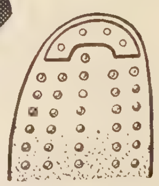

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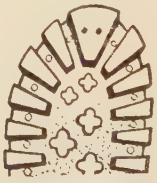

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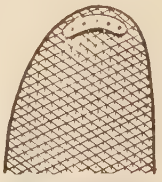

AVIAFLEX RUBBER

Selection of Apiary Sites; Shifting Hives

Seasonal Notes for the Domestic Beekeeper

APIARY sites should be located with great care, as future honey crops depend to a large extent on the location of the hives. Two or three factors should be kept in mind, and of these, reasonable shelter from cold prevailing winds is perhaps the most important. A maximum amount of sunshine is also desirable and all hives should be placed in any position facing north, if possible, to ensure this, especially during winter, as sunlight helps to keep the hives free from woodlice and other vermin.

[*Morgan*

This domestic apiary is sheltered from cold draughts and winds and receives maximum sunlight.

By D. A. BRISÇOE,

Apiary Instructor,
Department of Agriculture,
Tauranga

MOST domestic beekeepers are quite happy with one or two colonies in the back garden or, at the most, a few hives located in one or two reasonably handy out-apiaries. An area away from busy roads or footways and yet at the same time readily accessible is desirable.

Keeping bees near a road may be quite safe if the beekeeper has a quiet strain of bees and always does hive manipulations with the least possible disturbance and at the correct time of the day.

The warmest time of the day or early afternoon is usually the best time to carry out hive manipulations. Where domestic beekeepers live in densely populated areas care is necessary in placing colonies to ensure that neighbours are not troubled or stung by the flying bees.

Unused pieces of ground are often available near rivers or streams and any such locations are usually very suitable, as flying bees would be well away from other houses. It is important when a site like this is being decided on that the bees are placed well above flood-water level and that they are accessible at all times. During spring, when brood rearing is at its height, the bees require a lot of water and unless a supply is readily available they may become a nuisance around nearby drinking troughs and outside water taps.

Shelter Can be Too Effective

At one time a closely sheltered apiary was considered ideal because of the protection afforded the bees in rough, windy weather. Many beekeepers now realise that when shelter is too effective, especially in districts where spring nectar sources are available, early brood rearing becomes extensive and bees build up colony strength too rapidly and too soon for the main flow. With this activity stores consumption is heavy. In dearth periods, before the main honey flow, stores can be reduced to a critical level, and unless feeding is resorted to, many such hives die out just when the main honey flow is in sight.

Where honey stores remain adequate for the needs of the colony, this early build-up of colony strength induces a premature swarming impulse. This impulse is difficult for the beekeeper to control and invariably colony strength is lost by the bees swarming before the honey flow begins.

Bees flying from very sheltered apiaries during cold, windy weather are caught by the cold winds outside the apiary area and are unable to return to the hives. After these conditions have prevailed over a period the hives become very much weakened in field bees and cannot store much surplus honey when the honey flow begins. Colonies in more exposed or airy locations do not suffer to the same extent, as bees then make very little effort to leave the hives in cool or windy weather.

Very sheltered apiaries are usually damp, and unless there is adequate air circulating round the hive equipment, especially during winter, the various hive parts soon rot.

Hives placed too close to shelter trees and hedges are not only deprived of much sunshine, but invariably are subject to excessive draughts which come through from the base of such shelter.

Under these conditions the colonies are not thrifty and the bees become ill tempered. Because the bees are difficult to handle, the beekeeper (as well as close neighbours) is liable to get badly stung when making seasonal manipulations.

Where space is limited the placing of hives in pairs in single rows appears to be the most profitable layout. A driveway can be left at the back of the hives or down the centre of the rows.

Where ample space is available the setting out of hives in groups has many advantages. Though the placing of hives in jumble fashion is perhaps the best method of reducing drift to a minimum, it creates a difficulty in keeping the grass cut between the colonies and detracts from the appearance of the apiary.

Shifting Hives of Bees

From time to time domestic beekeepers require to shift their apiary sites. In an emergency hives may be moved at any time of the year provided special precautions are taken not to disturb the bees unnecessarily.

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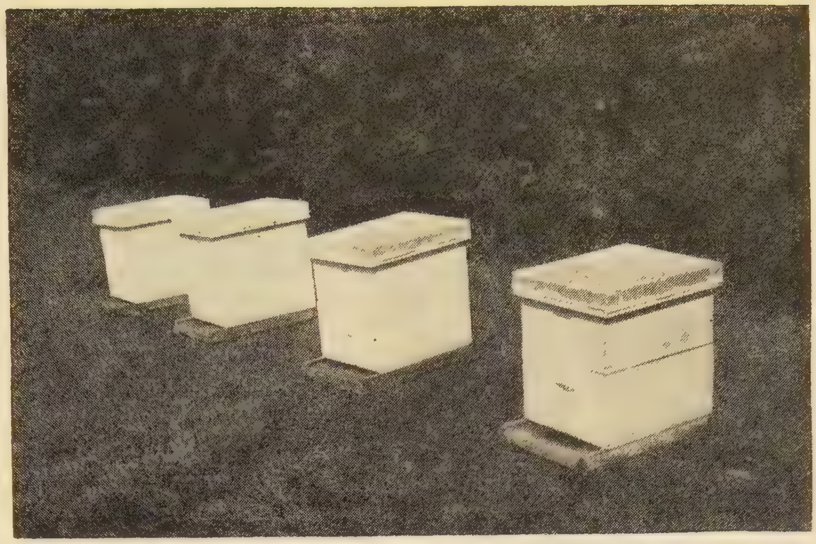
However, the best time to shift bees in most districts is in early spring, when there is comparatively little honey in the hive and brood rearing has just begun.

In shifts from one corner of the garden to another or from the front to the back of the section in spring or early summer the hive should be moved a few feet only each day in the required direction. It is advisable to place a board or some distinctive object alongside the alighting board to serve as a guide to returning field bees in finding the hive entrance.

If a hive is removed some distance to a new site, some of the field bees are likely to return to their original site once the moved hive has been opened. A small nucleus hive left on the old hive stand will accommodate the returning field bees and after a few days they may be united again with the parent colony.

A few days before the removal is due to take place the colony should be prepared in the following manner:

Most honey will have been consumed by this time of the year. However, if there is any surplus honey on the hive, this should be taken off temporarily. If simplicity frames (without the shoulders on the end bars) are being used, it is advisable to pack some pieces of newspaper between the top bars to prevent the frames coming together and squashing the bees.



[*Rendells*

A domestic apiary placed a little way from the shelter so that hives have maximum sunshine.

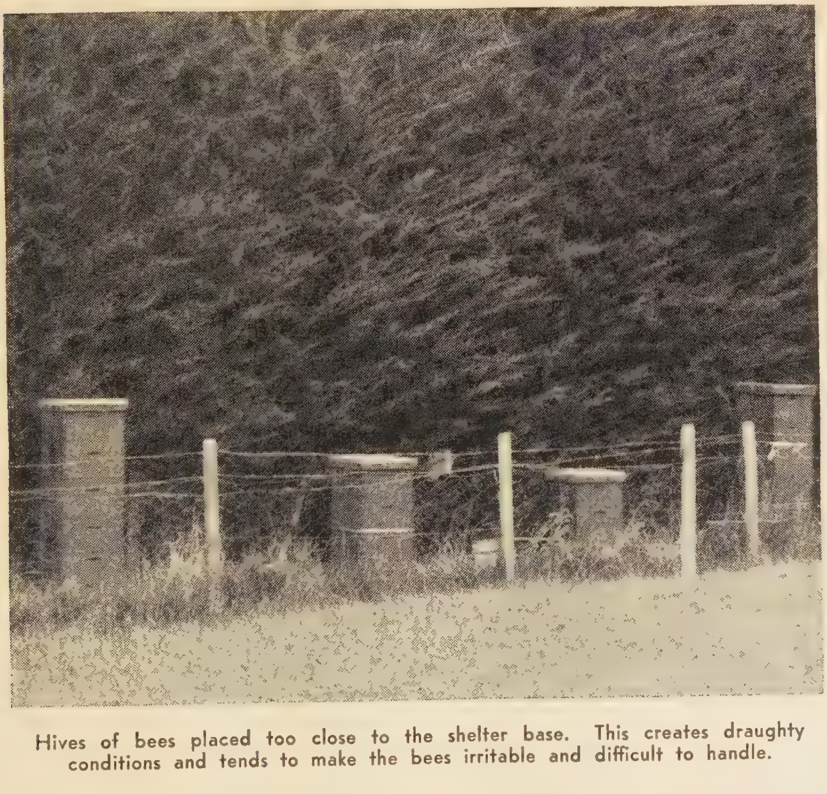
Proper crate staples can be bought quite cheaply and these should be used to hold the supers together and also prevent the bottom board slipping out of place. Slats of wood secured diagonally from the bottom board to the top super may be used as a good alternative.

The coolest part of the day—preferably the evening—should be chosen for the removal, and if only a short distance is to be travelled, the entrance can be blocked quite satisfactorily with grass. When the hive has been placed on its new site the bees should be allowed to settle down before being released; the grass blocking the entrance may then be removed.

If hives are to be shifted longer distances, added precautions have to be taken to ensure that the bees are not suffocated. A gauze screen with a 2 in. x 1 in. frame should be constructed to fit the top of a standard super. The hive lid and mat are removed and replaced with a wire screen.

All hives to be removed should be sound and of standard dimensions to prevent bees escaping through badly fitting hive parts. The entrance of the hive may be blocked with a piece of wood or preferably a piece of wire gauze the length of the hive opening and about 4 in. wide, pushed inward at the entrance, the tension on the gauze itself being sufficient to hold it in place. The mat and lid are placed back in position after the shift has been completed and the bees allowed to settle down.

Beekeepers are reminded that under the Apiaries Act 1927 a removal permit must be obtained from the district Apiary Instructor before bees may be moved more than 10 chains from the registered apiary.



Hives of bees placed too close to the shelter base. This creates draughty conditions and tends to make the bees irritable and difficult to handle.

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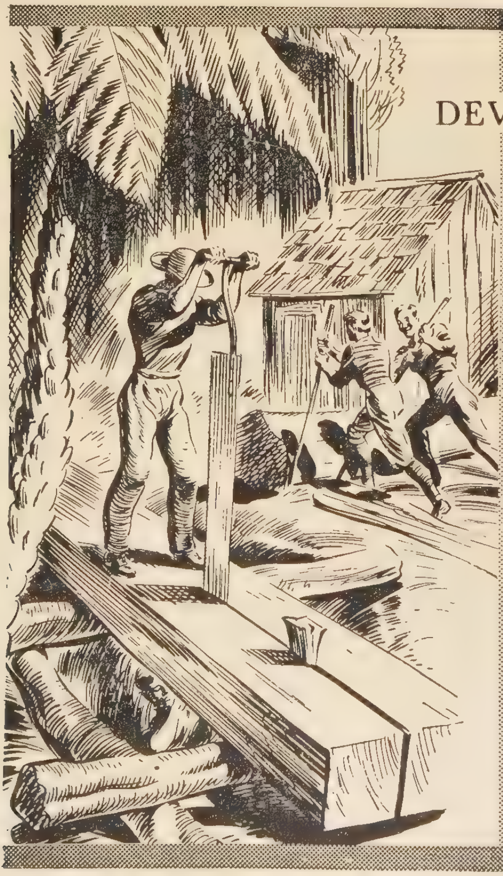

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Selenium and Animal Health

RESULTS of recent trials by Wallaceville Animal Research Station workers with selenium in the control of white muscle disease and hogget ill-thrift were discussed in a paper to the Ruakura Farmers' Conference in June by W. J. Hartley*, pathologist at Wallaceville. He emphasised that selenium is a highly toxic substance and that though considerable work is being done at Wallaceville, it might be some time before a selenium treatment that was safe, effective, and practicable could be recommended.

SELENIUM until two years ago was of importance in animal health only because of its poisonous properties. In certain areas of the world, particularly the arid western regions of the U.S., the soils contain toxic amounts of selenium. In these seleniferous areas the common cereal and pasture plants may contain from 20 to 30 parts per million of selenium and certain weeds may contain up to 10,000 p.p.m. (It is considered that levels of as low as 5 p.p.m. can produce chronic selenium poisoning in animals.)

In cattle a disease called blind staggers is attributable to chronic selenium poisoning; in horses there is a loss of hair from mane and tail, with misshapen hoofs. Because of the possibility of selenium poisoning in humans eating foodstuffs grown on seleniferous soils most countries in their food and drug acts stipulate that foodstuffs shall contain no selenium.

How did such a toxic element like selenium come to be used in the control of white muscle disease in sheep and also in hogget ill-thrift?

It has been known for many years that when small laboratory animals are kept on a vitamin E deficient diet they will develop characteristic degenerative changes in the muscles. As identical changes are seen in sheep affected with white muscle disease, vitamin E, in the form of alpha tocopherol acetate, has been widely used in New Zealand for the treatment of white muscle disease in lambs. On many properties affected lambs appear to benefit from this therapy. Very recent work in the U.S. has shown that minute quantities of selenium can replace vitamin E in certain vitamin E deficient diets. As a result of this observation Wallaceville workers immediately carried out extensive field trials in the South Island to see if selenium could control white muscle disease in lambs.

What is white muscle disease?

White muscle disease or stiff lamb disease is so called because affected lambs show a stiff, stilted gait and on post-mortem show a chalky white discolouration of the heart and body and limb muscles.

Distribution and Incidence

White muscle disease is prevalent in the South Island, particularly in Canterbury and Central Otago. Recently sporadic cases have also been reported on the pumice soils in the Rotorua-Taupo area. It occurs from September to January in lambs from birth up to three or four months of age. Losses have occurred in lambs derived from all breeds and ages of ewes, including ewe hoggets. The congenital form (referred to later) has occurred only in property bred ewes and not in ewes that are brought in from other areas just before tupping. Losses have been much more severe in some years than in others and even on one property one mob of lambs may be badly affected and other mobs be unaffected.

Most outbreaks of white muscle disease have occurred on country classified as stony silt loams and which was until recently in native pasture and largely run out. After ploughing, seeding with improved pasture strains, the liberal application of phosphatic fertilisers, and in some cases also the introduction of irrigation this type of country now produces lush autumn and spring growth, particularly of clovers and lucerne.

Most outbreaks of white muscle disease are seen at pasture and are apparently unassociated with exercise. On some properties, however, where there have been only a few cases on pasture, driving has precipitated a severe outbreak. On a few properties outbreaks occur only immediately after driving. The incidence of white muscle disease in an affected mob at pasture is rarely greater than 50 per cent, but after driving it may reach 100 per cent. The mortality usually does not exceed 20 per cent; however, over 50 per cent of affected lambs may die in outbreaks precipitated by driving.

In the congenital form up to a half of the lambs born may die as a result of white muscle disease. In these instances there are usually only relatively few losses from the disease in lambs over one week old.

Signs of Disease

White muscle disease is seen in two forms—the congenital form, where the lamb is affected at birth, and the delayed form, which usually does not become apparent until the lamb is a few weeks old. In the congenital form lambs are either born dead or die suddenly within a few hours to three days of birth.

In the delayed form, which is more common in lambs three to six weeks of age, the lambs show a stiff, stilted gait with an arched back, are disinclined to move about, lie down a lot, lose condition, and, if badly affected, become prostrate and die from starvation or exposure. Less severely affected lambs often make a slow recovery provided they are able to walk about and suckle. Lambs with severe heart involvement may die suddenly without any prior signs of stiffness. On some properties affected lambs have shown a profuse diarrhoea.

The signs shown by lambs affected with white muscle disease could be confused with cases of foot rot, "scald", arthritis, or tetanus. However, once a post-mortem is carried out there should be no difficulty in arriving at the correct diagnosis.

Post-mortem Findings

In the congenital form the lamb may be born dead or may have survived the birth process and have walked and in some cases also have had a feed. In these lambs there is an excess of a clear fluid often with gelatinous clots in the chest and abdominal cavities and also in the heart sac. The heart shows localised to widespread chalky white discolouration of the walls of the chambers and, in some cases, the muscles of the thigh, loin, and shoulder are either paler than normal, show white striations, or are of a uniform chalky colour. In the delayed form similar abnormalities are noticed, but they are usually more severe in the limb musculature.

The changes in the heart and limb musculature are the result of death of the muscle fibres, which then become calcified. Affected limb musculature will regenerate, but affected heart musculature does not.

Prevention and Control

The use of selenium in the prevention of white muscle disease in lambs was explored by Wallaceville workers.

---

* Co-authors of the paper with Mr Hartley were C. Drake, Scientific Officer, and A. B. Grant, Principal Scientific Officer, both of the Department of Agriculture's Wallaceville Animal Research Station.

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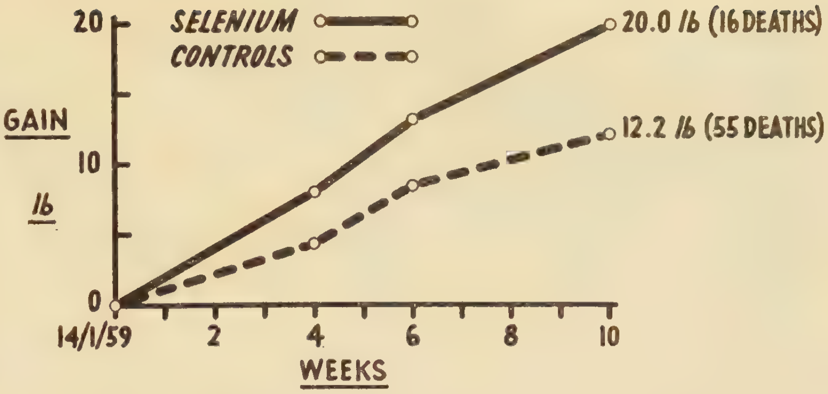

Fig. 1—Average weight gain of survivors of selenium treated and control lambs on eight properties in the Rotorua-Taupo district (201 sheep per group).

Ewe trials: On three properties experiencing outbreaks of congenital white muscle disease the 1,200 ewes remaining to lamb were divided into three equal groups. One group received 5 mg of selenium as sodium selenate by mouth; one group received 300 mg of alpha tocopherol acetate by mouth; and the other group received no treatment.

The outcome of these trials, summarised in Table 1, confirms previous observations that vitamin E given in late pregnancy does not protect the lamb from white muscle disease. However, selenium treatment at such a late stage of pregnancy does appear to have been of some value.

TABLE 1—EFFECT OF SELENIUM AND VITAMIN E TREATMENT ON NEW-BORN LAMB MORTALITY

	Lamb deaths attributable to:	
Ewe treatment	White muscle disease	Other causes
Selenium	20	20
Vitamin E	54	25
No treatment	41	18

Lamb trials: On 16 properties that had previously experienced the delayed form of white muscle disease lambs were divided into three equal groups at docking. One group received 1 mg of selenium as sodium selenate; one group received 300 mg of alpha tocopherol acetate; and a third group received no treatment. On seven properties the selenium and alpha tocopherol acetate were given as one subcutaneous injection; in the remainder these agents were given by mouth weekly until the lambs were from two to three months old. White muscle disease appeared on 11 of the trial properties, but in no instance were there severe outbreaks.

The results of these trials are summarised in Table 2. Vitamin E had some effect in preventing white muscle disease while selenium almost completely prevented it.

TABLE 2—EFFECT OF PROPHYLACTIC TREATMENT OF LAMBS WITH SELENIUM AND VITAMIN E IN PREVENTION OF WHITE MUSCLE DISEASE

Losses attributable to white muscle disease		
Selenium groups	Vitamin E groups	Controls
2	21	50

Recommendations

If an outbreak of the congenital form of white muscle disease occurs, it is suggested that all ewes yet to lamb be given selenium. On properties that annually experience the delayed form of white muscle disease it is suggested that the ewes be given a dose of selenium two to three weeks before lambing, with the lambs receiving a dose at docking. When an outbreak of white muscle disease occurs in lambs it would be sound practice to give selenium to the remainder and treat affected ones with vitamin E. (We have not yet had any experience of the treatment of white muscle disease by selenium.)

Hogget Ill-thrift

Hogget ill-thrift is the name given to an ill defined condition in which lambs fail to thrive in the presence of abundant apparently highly nutritious pasture. It is seen in two forms. One form occurs any time from November onward in both islands. It is usually relatively insidious in onset, may be spread over several months, and has a variable mortality. The other form characteristically occurs in the North Island after the warm early autumn rains and appears to be directly associated with unattractiveness of the fresh growth of grass.

The known causes of the former type of ill-thrift are cobalt deficiency and internal parasites. The major contributing cause is not yet known, but preliminary investigations indicate that it may in part be due to selenium deficiency.

One of the most severely affected areas experiencing the insidious form of ill-thrift is the newly brought in clover-dominant pumice country in the centre of the North Island. As white muscle disease was recently reported in this area, we explored the possibility of selenium alleviating this ill-thrift. Controlled trials were instituted in January 1959 on eight badly affected farms in the Rotorua-Taupo area where farmers had lost from 10 per cent to 40 per cent of their lambs since docking.

On each property ill-thrifty lambs were randomised into equal groups containing from 20 to 35 animals, the average weight of which at the commencement of the trials ranged from 34 to 49 lb. One group of lambs received 5 mg of selenium as sodium selenate by mouth at the start of the trial; this was repeated in two weeks and again four weeks later. All lambs were weighed at the commencement, two weeks later, and thence monthly until the trial had been in progress for 10 weeks.

Fig. 1 is a composite graph depicting the results of these eight trials. It shows that the average weight increase of the survivors from the selenium

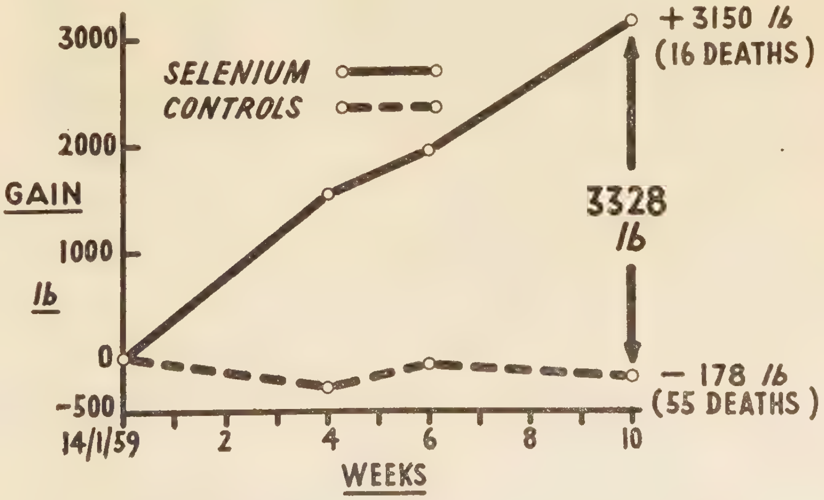

Fig. 2—Total liveweight changes in selenium dosed lambs and control lambs on eight properties in the Rotorua-Taupo district (201 sheep per group).

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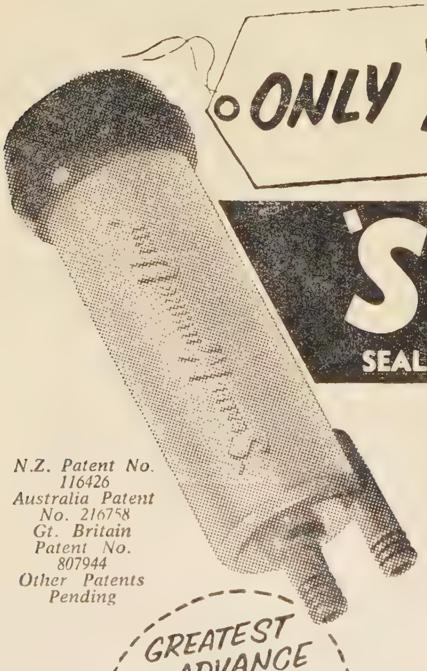

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treated groups was 20 lb compared with approximately 12 lb for the survivors of the controls. Further, the death rate in the controls was between three or four times greater than in the selenium dosed groups. Almost all the deaths in latter groups occurred within the first month, whereas the deaths in the controls occurred fairly regularly throughout the trials. (Concomitant trials with cobalt, copper, and phenothiazine failed to give any weight response.)

A more realistic picture in terms of loss of production from ill-thrift in these eight trials is shown in Fig. 2. This graph depicts the change in total liveweight of the selenium dosed lambs compared with the controls. Here the obviously much greater difference between treated and control animals is the result of death being considered as a loss in total liveweight instead of being ignored as it was in Fig. 1. As a result of the high mortality (27 per cent) and the lower growth rate the untreated animals have experienced an actual loss of total liveweight of 178 lb, whereas the dosed animals have gained 3,150 lb.

These trials clearly showed that selenium controlled outbreaks of ill-thrift in the Rotorua-Taupo area both quickly and effectively.

Other North Island Trials

As a result of these encouraging observations we extended our investigations to the southern half of the North Island, where there was much ill-thrift but where white muscle disease had not been recognised. Controlled selenium trials have been conducted on 20 properties in the Wellington, Wairarapa, and Manawatu districts during the last four months.

A mild to a marked response to selenium has been obtained on the sandy coastal soils of the Manawatu. Fig. 3 compares the weight gain between selenium treated and control lambs on a property close to Flock House at Bulls; similar results were also obtained on Flock House itself. Fig. 4 shows that cobalt deficiency can mask an apparent selenium deficiency.

A mild to a moderate response to selenium has also been observed on the stony soils of the Wairarapa. Figs. 5 and 6 show the response to selenium in lambs at Greytown and at Pirinoa.

Similar trials have been carried out in the South Island by Wallaceville and other workers. This year was a good year for lambs in the South Island, as there was little ill-thrift; however, on a number of properties in Canterbury there was a mild growth response to selenium in thrifty and ill-thrifty lambs. On all properties experiencing congenital white muscle disease last season there was no subsequent ill-thrift problem in the lambs.

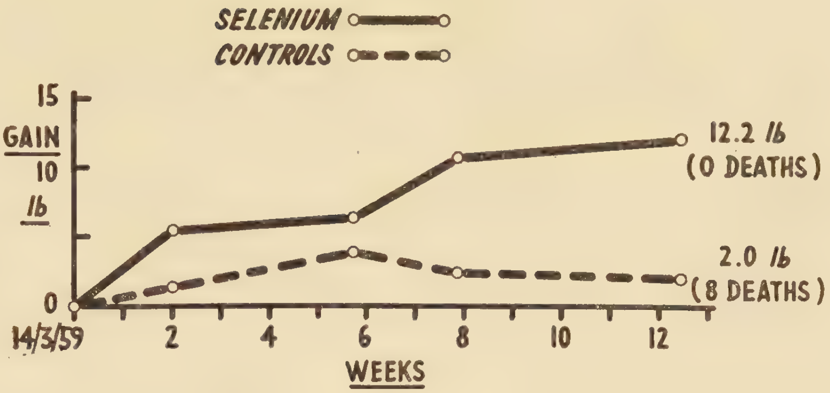


Fig. 3—Average weight gain of survivors of selenium treated and control lambs on a property at Bulls (20 sheep per group).

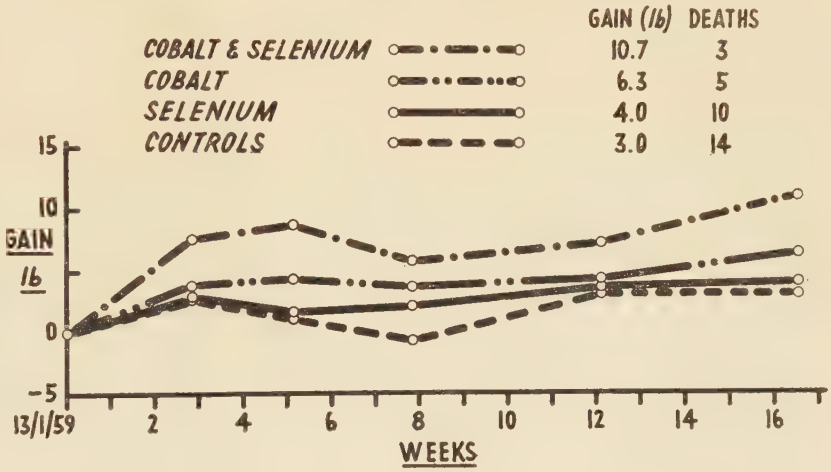


Fig. 4—Average weight gain of survivors in four groups of lambs on a Waikanae property (20 sheep per group).

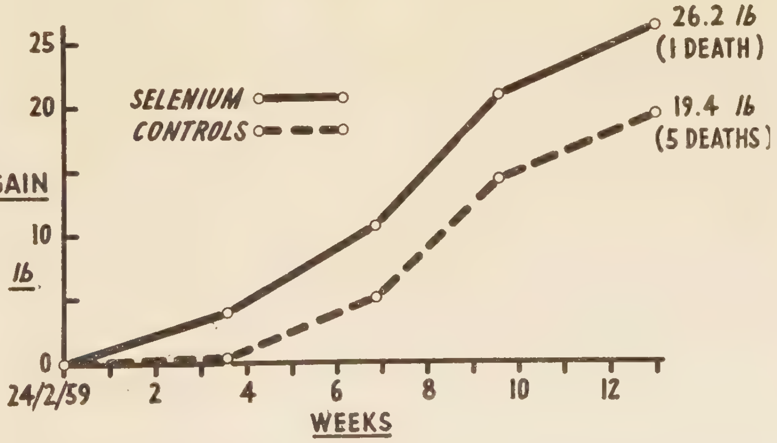


Fig. 5—Average weight gain of survivors of selenium treated and control lambs at Greytown (30 sheep per group).

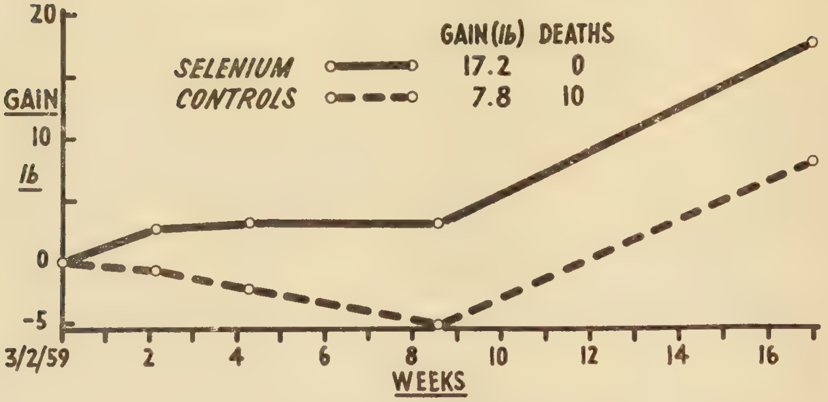


Fig. 6—Average weight gain of survivors of selenium treated and control lambs at Pirinoa (24 sheep per group).

The only trial with the autumn flush type of ill-thrift carried out to date has clearly shown that there was **no** response to selenium.

In all the investigated outbreaks of the insidious type of ill-thrift there has been some response to selenium; however, only on odd properties has the maximum growth rate been achieved. Our initial observations thus indicate that selenium, like cobalt and parasitism, plays some part in the general problem of hogget ill-thrift. It is important to realise that selenium is **not** the cure for all ill-thrift.

Recommendations

Selenium will control certain outbreaks of ill-thrift, particularly those occurring on the light type of soils. Our advice therefore to farmers experiencing ill-thrift on pumice, sandy, and stony country is to get in touch with their local veterinarian or the local office of the Department of Agriculture with a view to carrying out a selenium trial.

Selenium is a highly toxic substance and we have had only very limited experience in its use. We do not yet know the effective dose rate nor how frequently it has to be administered. Considerable work on selenium is being undertaken at Wallaceville, but it may be some time before we are able to recommend unconditionally a selenium treatment that is safe, effective, and practicable.

Closing Paddocks for Silage

An early decision should be made as to areas required for silage. As a guide the average yield of silage crops is 6 to 7 tons per acre. A dairy cow on sparse grazing requires 50 lb of silage a day and a milking cow feeding autumn-saved pasture 35 to 40 lb of silage a day as a supplement. To winter 1,000 ewes about 150 tons of silage would be required with grass and possibly other feed.

Normally fields should not be closed for silage until a surplus of grazing becomes apparent. Fields should then be closed throughout spring as they can be spared. The main object should be to keep the pasture in a leafy stage for grazing and to close sufficient other fields for silage or hay to obtain this.

The time of closing varies according to district, but generally paddocks can be closed from September on. It is wiser to close paddocks which were grazed during winter rather than those which contained autumn-saved pasture.

The earlier a paddock can be closed for silage the better the aftermath. This aftermath is very valuable grazing in early summer. Later closed paddocks may take 12 weeks or more before being ready for ensiling.

When paddocks are closed in September or early October this first flush of spring growth can be made into silage in eight to nine weeks. Containing much leafy material such silage has a high nutritive and digestibility value. To ensure early harvesting only those fields which are dominantly ryegrass and white clover should be closed.

If closing dates of silage paddocks are spaced so that areas are ready for cutting at regular intervals, much better silage can be made, due to better control over time of cutting.

First cuts from lucerne areas may conveniently be made into silage, as weather at this time is frequently unsuitable for making hay.

—*W. R. CRAWFORD,*
Fields Instructor,
Department of Agriculture,
Blenheim

New Superintendent at Winchmore Irrigation Research Station

MR W. R. LOBB, Assistant Fields Superintendent, Department of Agriculture, Christchurch, has been appointed Superintendent of the Department's Winchmore Irrigation Research Station, Ashburton. He succeeds Mr G. K. McPherson, who was recently appointed Fields Superintendent of the Department at Dunedin.

Mr Lobb has specialised in farm improvement in the South Island ever since he joined the Department in 1937 as an Assistant Instructor in Agriculture at Dunedin. After holding Instructorates at Ranfurly, Dunedin, and Oamaru he was appointed Assistant Fields Superintendent at Christchurch in 1955.

Mr Lobb.

In the last few years Mr Lobb has done considerable work on trace elements. His progressive outlook enabled him to seize on the importance of molybdenum and sulphur and the work that has been done on these two elements has had far-reaching effects on farming in Otago and Canterbury.

CHANGE OF ADDRESS OF "JOURNAL" SUBSCRIBERS

To ensure continuity of delivery of issues of "The New Zealand Journal of Agriculture", subscribers are required to give 4 weeks' notice of change of address. The old address (preferably an address label clipped from a recent "Journal" wrapper) and the new address should be sent to the nearest office of the Department of Agriculture. This notification should be made in addition to any given to the Post and Telegraph Department.

Mucosal Disease Apparently Due to Combination of Virus and Other Factors

THE New Zealand type of mucosal disease appears to be primarily a virus infection, but the disease does not develop until activated by some factor or factors. This finding from Wallaceville Animal Research Station investigations was given in a report at the Ruakura Farmers' Conference Week by R. M. Salisbury, the station's Chief Diagnostic Officer. Much work has still to be done to elucidate the true nature of the condition, he said. This is being pursued vigorously.

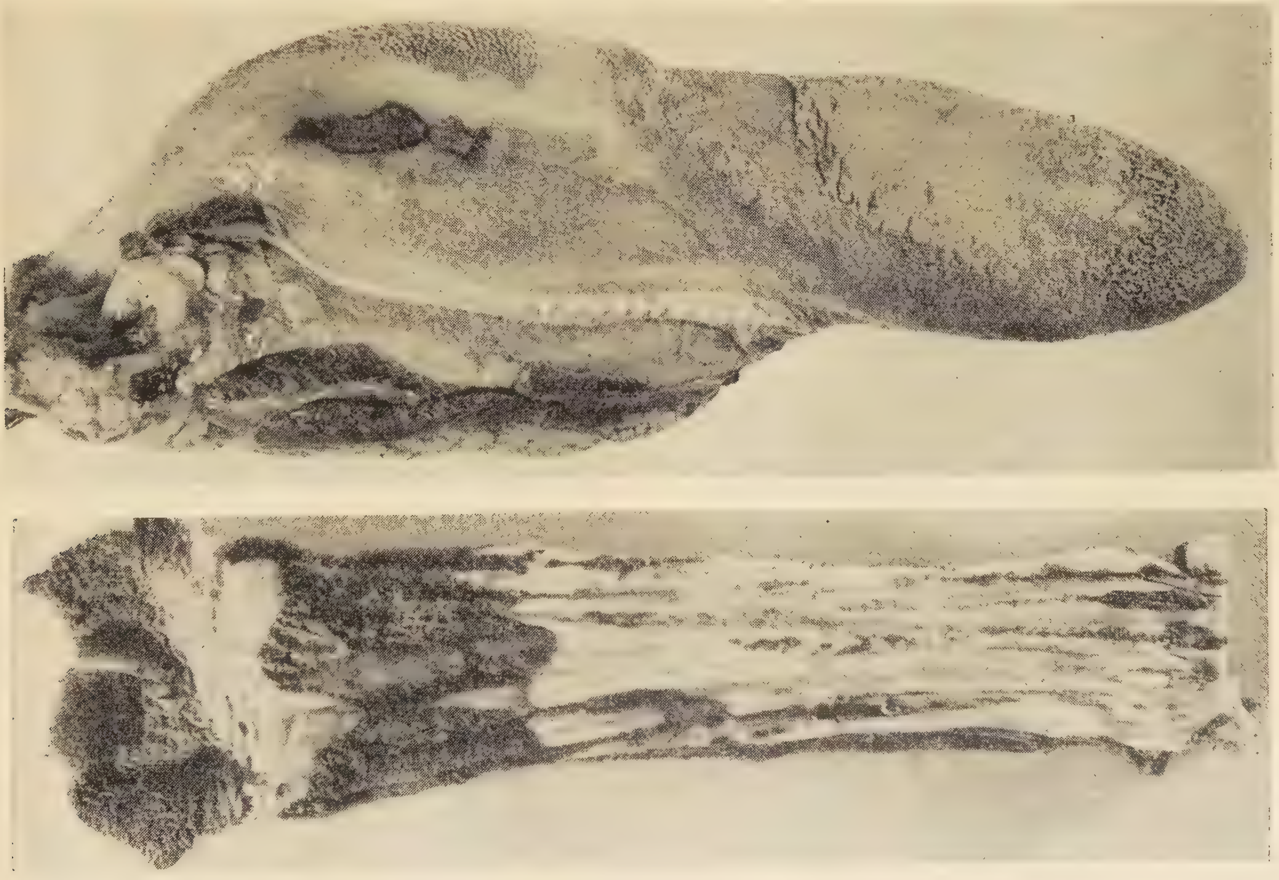
MR SALISBURY, who with Dr L. B. Fastier visited the U.S.A. to confer with United States research workers about mucosal disease, considered that the type of mucosal disease observed in the outbreaks in New Zealand had some features in common with the disease known by that name in America. However, there were some essential differences which necessitated independent investigation in New Zealand to elucidate its true nature and cause.

Originally there had been some suggestion that the disease had spread by direct contact. Recent experience suggested that all the outbreaks occurred independently.

With one exception the disease was confined to cattle 18 to 24 months old. Affected animals lost condition rapidly and showed a brownish-green scour. They did not eat, but continued to drink, remained quite bright in the eye, and showed no discharge from the mouth, nostrils, or eyes.

Laboratory Findings

Laboratory examinations discounted the possibility of the disease being caused by lead, arsenic, molybdenum, copper, or DNBP poisoning or by bacteria. DNBP spray had been used on a pea crop the stubble of which was grazed by affected stock on the first property where deaths occurred, but it was extremely doubtful if by



Upper—Ulceration of the gums, cheeks, and tongue occurred in about 30 per cent of the mucosal disease cases. The tongue shown has a large ulcer and there is scaling off of the rough surface tissue. Lower—All the affected animals examined had ulceration of the gullet. It is severe on the specimen shown, particularly on the portion of the gullet before it enters the rumen (first stomach).

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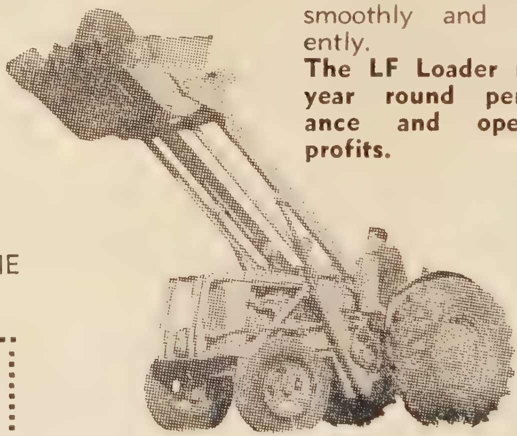

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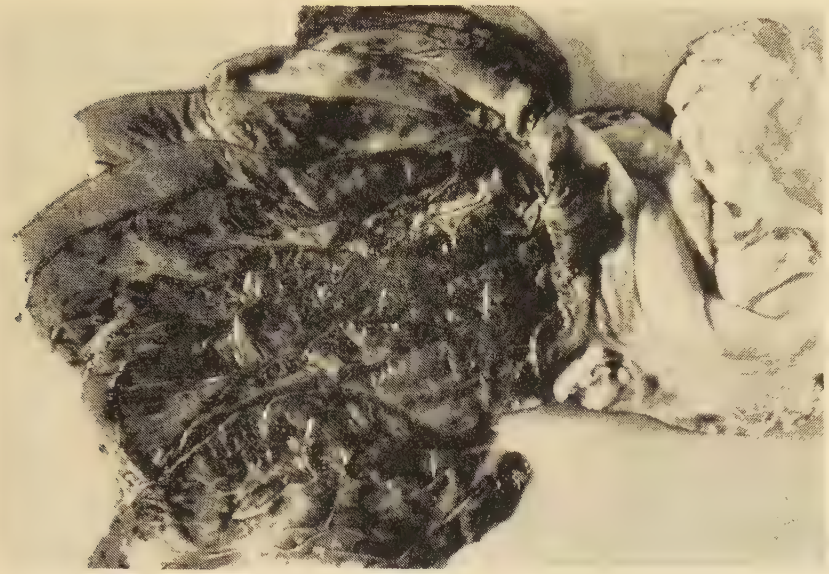
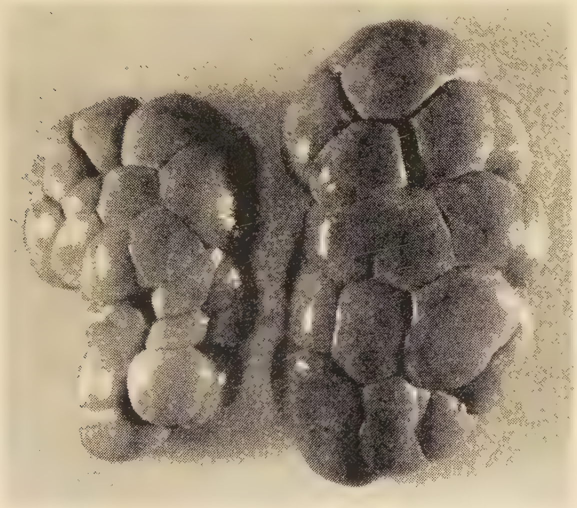


Abomasum (fourth stomach) from mucosal case, showing severe inflammation and hemorrhage. This organ was invariably affected in diseased animals.



Severe kidney damage has been a constant finding in mucosal disease cases. In the specimens at left the cortex (outer layers) is very pale and deterioration of tissue has started.

the time stock had access to this feed sufficient spray residue remained to affect them.

Isolation of Virus

A virus has been isolated from specimens and when material from infected animals was inoculated into susceptible young cattle a mild disease was reproduced, indicated by a temperature rise on the seventh or eighth day after inoculation, fleeting diarrhoea, and ulcers in the mouth. Results were in line with those obtained in experiments in the United States and Britain, where mucosal disease in the typical form in which it occurred in the field has not been reproduced experimentally.

Acorn Poisoning Studies

In the last five outbreaks of the disease in New Zealand animals had had access to acorns during the two weeks before sickness was noticed. Acorn poisoning might well have proved the explanation had not the first three outbreaks occurred among animals which had not been on areas where acorns were available to them. Wallaceville experiments have proved that acorns are toxic, poisoning seemingly primarily to cause liver damage. Chronic poisoning produced kidney damage similar to that in mucosal disease. Investigations into acorn poisoning in cattle are being continued at Wallaceville.

Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of November:

NORTH ISLAND

October

*16 and 17 October—Poverty Bay A. and P. at Gisborne.

*20, 21, and 22 October—Hawke's Bay A. and P. (Centennial Show) at Hastings.

29, 30, and 31 October—Waikato A. and P. at Hamilton.

30 and 31 October—Wairarapa and East Coast P. and A. at Carterton.

November

1 November Cambridge A. and P. at Cambridge.

*5, 6, and 7 November—Manawatu and West Coast A. and P. (Royal Show) at Palmerston North.

7 November—Tokoroa A. and P. at Tokoroa.

13 and 14 November Whangarei A. and P. at Whangarei.

13 and 14 November—Wanganui A. and P. at Wanganui.

*14 November—Clevedon A. and P. at Clevedon.

14 November—Waihi A. and P. at Waihi.

20 and 21 November—Egmont A. and P. at Hawera.

*21 November—Bay of Islands P. and I. at Waimate North.

21 November—Rotorua A. and P. at Rotorua.

27 and 28 November—Auckland A. and P. at Epsom.

27 and 28 November—Stratford A. and P. at Stratford

SOUTH ISLAND

October

*17 October—Ellesmere A. and P. at Leeston.

24 October—Northern A. and P. at Rangiora.

30 and 31 October—Marlborough A. and P. at Blenheim.

31 October—Ashburton A. and P. at Ashburton.

31 October—Amberley A. and P. at Amberley.

November

*11, 12, and 13 November—Canterbury A. and P. at Christchurch.

14 November—Tokomairiro A. and P. at Milton.

18 November—North Otago A. and P. at Oamaru.

20 and 21 November—Nelson A. and P. at Richmond.

21 November—Waimate A. and P. at Waimate.

21 November—Courtenay A. and P. at Kirwee.

*21 November—West Otago A. and P. at Kelso.

24 and 25 November—Timaru A. and P. (South Island Championships) at Timaru.

*28 November—South Otago A. and P. at Balclutha.

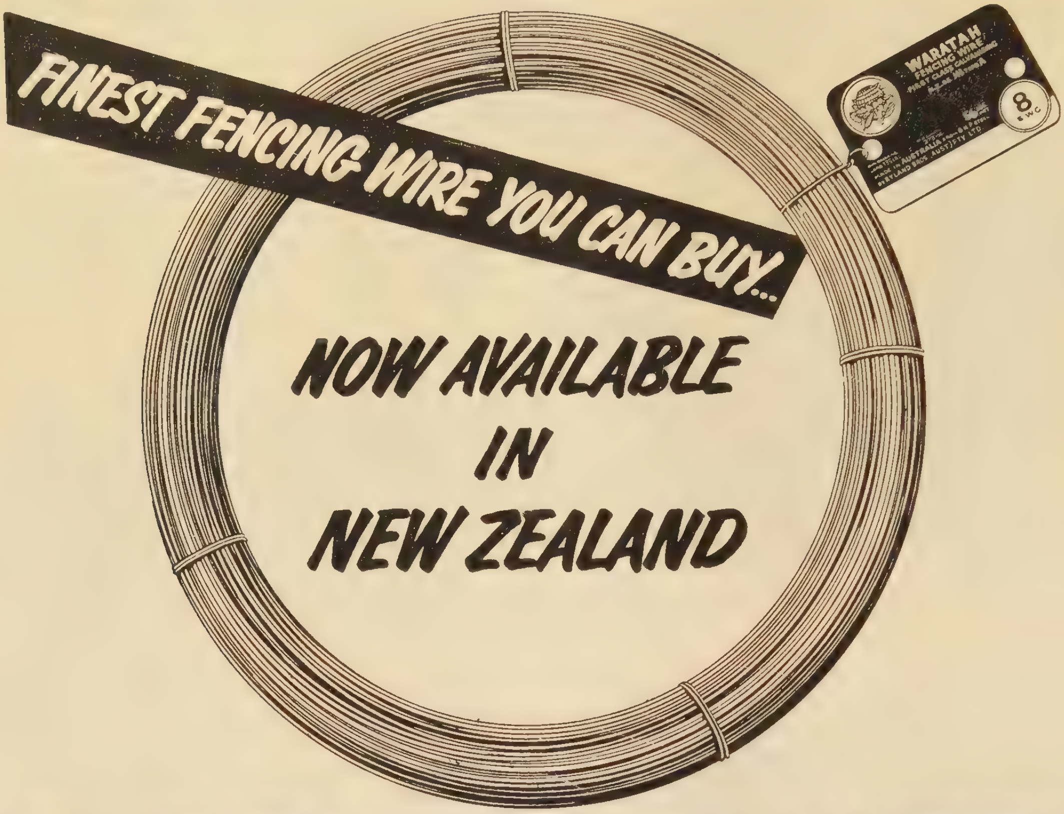
28 November—Motueka A. and P. at Motueka.

* The Department of Agriculture exhibit will be staged at this show.

Wool Sales

The dates and venues of wool sales up to the end of December are:

15 and 17 October: Dunedin.
21 October: Invercargill.
28 and 30 October: Christchurch.
31 October: Timaru.
9 November: Auckland.
13 November: Wanganui.
18 and 20 November: Napier.
25 November: Wellington.
4 December: Christchurch.
9 December: Invercargill.
14 December: Dunedin.
18 December: Timaru.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Recent Research Work

Responses to Phosphate and Sulphur on Irrigated Pastures at Winchmore

GOOD responses to superphosphate at 1½ cwt per acre per annum have been obtained on irrigated pastures at the Department of Agriculture's Winchmore Irrigation Research Station. At this rate of topdressing, a high producing sward of perennial ryegrass and white clover was maintained under sheep grazing. Heavier annual applications of superphosphate gave relatively small additional growth responses.

SUPERPHOSPHATE contains about 21 per cent of phosphoric acid in the form of mono-calcium phosphate and 11 per cent of sulphur in the form of gypsum (calcium sulphate). Since it has been known for several years that most light plains soils of Canterbury require not only phosphorus but sulphur for satisfactory pasture growth, a trial was begun at Winchmore in late autumn 1957 to determine to what extent growth responses to superphosphate are due to sulphur and to what extent they are due to phosphorus.

DESCRIPTION OF TRIAL

The trial was laid down on a border-diked sheep pasture which had not received superphosphate for a number of years. The dominant species were perennial ryegrass, cocksfoot, and white clover, with short-rotation ryegrass, timothy, and Montgomery red clover as sub-dominant species. The soil, Lismore stony silt loam, is shallow, flat, and well drained. All plots were well supplied with lime and potash and were irrigated whenever half of the available soil moisture was depleted.

Rates of ⅜, ¾, and 1½ cwt per acre of mono-calcium phosphate and of ½, 1, and 2 cwt per acre of gypsum were applied on 1 May 1957. In addition there were treatments in which one or both of the fertilisers were omitted. All the possible combinations gave a total of 16 treatments. Applications were equivalent to the phosphate and sulphur content of 0, ¾, 1½, and 3 cwt per acre of superphosphate respectively.

The trial was mown at two- to four-weekly intervals and nearly all clippings were returned to the plots after weighing and sampling for dry matter content. Pasture composition was determined on many occasions.

RESPONSES IN YIELD TO PHOSPHORUS AND SULPHUR

In the following tables the total dry matter production for individual treatments is shown:

TOTAL DRY MATTER PRODUCTION PER ACRE FOR 1957-8

Mono-calcium phosphate per acre	Gypsum per acre			
	0	½ cwt	1 cwt	2 cwt
	lb per acre			
0	3,720	4,500	4,220	4,960
⅜ cwt	4,310	5,570	5,820	6,280
¾ cwt	4,220	5,910	6,620	6,620
1½ cwt	4,310	6,160	7,320	8,170

The responses to treatments may be more easily seen if expressed in relative terms, where production from plots receiving no phosphate or sulphur equals 100.

RELATIVE RESPONSES

Mono-calcium phosphate per acre	Gypsum per acre			
	0	½ cwt	1 cwt	2 cwt
0	100	121	113	133
⅜ cwt	116	150	156	169
¾ cwt	113	159	178	178
1½ cwt	116	166	197	220

EFFECT OF SULPHUR ON PHOSPHATE RESPONSES

1. Significant responses to phosphate were obtained only in the presence of sulphur.

2. Responses to phosphate increased progressively with increasing rates of gypsum up to 1 cwt per acre. In other words, the relative responses to various rates of phosphate were not higher in the presence of gypsum at 2 cwt per acre than at 1 cwt per acre.

EFFECT OF PHOSPHATE ON SULPHUR RESPONSES

1. In the absence of phosphate, gypsum gave a significant response only when applied at the highest rate.

2. Responses to gypsum increased progressively with increasing rates of phosphate.

PASTURE COMPOSITION AND APPEARANCE

The pasture composition was not much affected by phosphate or sulphur alone. However, the two nutrients interacted markedly by stimulating the growth of white clover.

1. Phosphate in the absence of sulphur gave only a small response in perennial ryegrass and white clover, partly at the expense of cocksfoot. However, the pasture on plots which had received phosphate but no sulphur was much paler than on control plots.

2. Sulphur in the absence of phosphate did not affect the botanical composition to any extent but gave a darker sward. During winter 1958 cocksfoot suffered more from frost burn on sulphur without phosphate plots than on any other plots.

3. During autumn and winter 1958 the pasture on phosphate plus sulphur plots had not only the highest content of white clover but of perennial ryegrass. It appeared healthy and the effects of frost burn were negligible.

CONCLUSION

Results obtained in this trial are applicable only to this and similar irrigated sites on Lismore stony loam which have not been topdressed with superphosphate for a considerable time. They indicate that the ratio of phosphorus to sulphur in superphosphate is suitable for the nutritional needs of pasture under these conditions. There is no evidence that a change-over from straight superphosphate to superphosphate-sulphur mixtures would be advantageous.

Footnote: It is possible that on irrigated sites which have been regularly topdressed with superphosphate in recent years the ratio of phosphorus to sulphur in that fertiliser is not the best available. The advisability of replacing superphosphate by superphosphate-sulphur mixtures on regularly topdressed sites is being studied by field experiments at present.

—*J. LAMMERINK*

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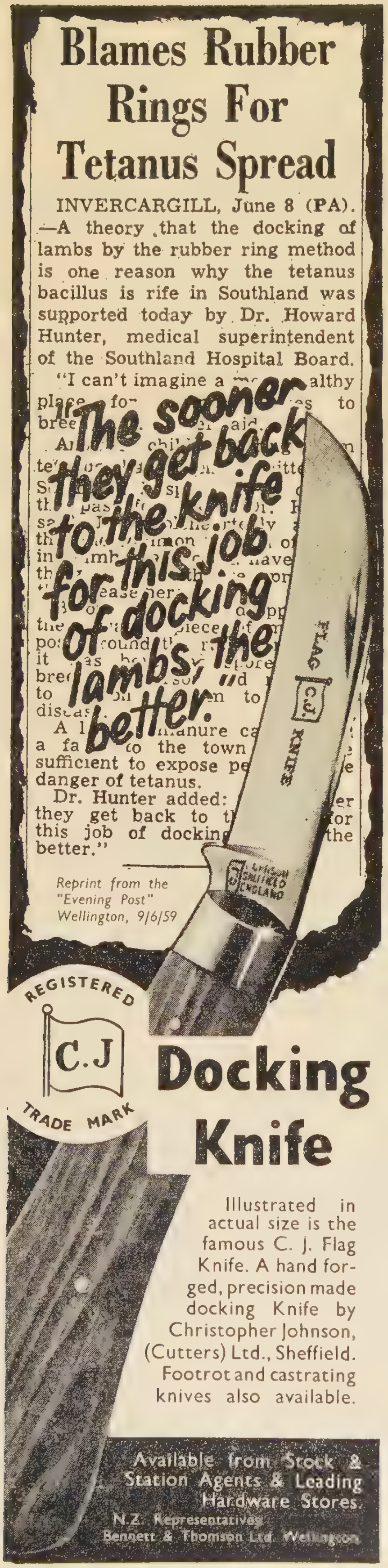

Blames Rubber Rings For Tetanus Spread

INVERCARGILL, June 8 (PA).—A theory that the docking of lambs by the rubber ring method is one reason why the tetanus bacillus is rife in Southland was supported today by Dr. Howard Hunter, medical superintendent of the Southland Hospital Board.

"I can't imagine a [illegible] althy place for [illegible] to bree[illegible] aid.

[illegible]

A l[illegible] manure ca[illegible] a fa[illegible] to the town [illegible] sufficient to expose pe[illegible] danger of tetanus.

Dr. Hunter added: [illegible] they get back to th[illegible] for this job of docking [illegible] the better."

Reprint from the "Evening Post" Wellington, 9/6/59

"The sooner they get back to the knife for this job of docking of lambs, the better."

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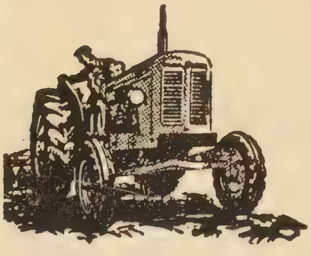

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ECONOMY

Log of David Brown 900D, by Mr. A. Howden, Lochiel. Kept on hour meter. Max. engine R.P.M. 1850. Oil consumption: No oil added between changes (120 hours).

CLASS OF WORK	HOURS WORKED	GALLONS USED	GALLONS PER HR.
Odd jobs, winter feeding, lambing, discing.	148	76	·51
Cultivations, odd jobs, mainly heavy work ploughing (Hyd. swamp. 2 15 x 8 furrows—3rd gear). (Hyd. Standard, 3 12 x 6 furrows—3rd gear). (Discing, 7′ tandems, trailing 3 leaf harrows and 9′ roller—3rd gear, 7′ tandems—4th gear).	173	114	·66
Discing—4th gear, 9′ roller trailing 3 harrows—4th gear.	34	19½	·57
11 tyne cultivator, 6″ deep on worked ground—4th gear.	7	4½	·64
Rolling, trailing 3 harrows on soft ground—5th gear.	7	6	·86
Rolling, trailing 3 harrows—4th gear.	7½	4½	·60
Total hrs. worked and fuel used since purchase 16/2/58.	**518**	**310**	**·60**

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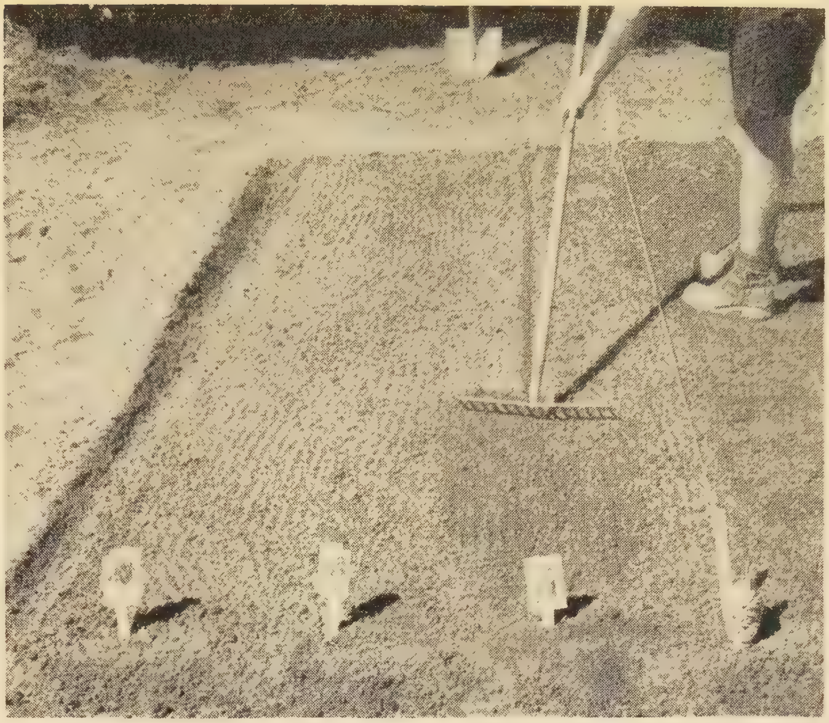
The Home Garden in October

By A. G. KENNELLY,
Horticultural Instructor,
Department of Agriculture,
Dunedin

SOWING and planting hardy vegetables whether for successional use or main crop is the most important job in most home gardens in October. Frost-tender vegetables can also be sown in most districts toward the end of the month when danger of killing frost is past or where protection can be given.


[Sparrow

Seed of many vegetables can be sown in October. Home gardeners often tend to think mainly of fairly immediate needs, but winter vegetables which have a long growing period will also have to be sown soon.

OCTOBER is a busy month in the home garden. Hardy vegetables should be sown or planted, autumn-sown green crops dug in, and land worked up and fertiliser applied in preparation for early planting or sowing.

Applying Fertilisers or Manures

The manurial requirement of a crop varies according to the crop grown, the type of soil, and its nutritional status. When crops are produced on a farm scale it is important to assess these as far as is possible and to apply the most economic type and amount of fertiliser, but in a home garden cost of production is not usually of much importance. Assuming other conditions are conducive to healthy growth, satisfactory crops will be produced if the soil is maintained in good physical condition by the addition of bulky organic manures and is dressed with a "complete" fertiliser before sowing or planting. This is one which contains the three major elements nitrogen, phosphorus, and potash.

Nitrogen is the element most obviously affecting the growth of foliage, its greenness, and its succulence. Plants such as cabbage, silver beet, and lettuce benefit from an abundance of nitrogen. Deficiency is marked by poor growth, pale foliage, short, thin, upright shoots, and early defoliation. Too liberal use of nitrogen produces soft, sappy growth and liability to disease and delays maturity. Fertilisers rich in nitrogen include dried blood, blood and bone, nitrate of soda, sulphate of ammonia, and urea.

Phosphorus is usually regarded as especially important in flower, fruit, and seed production and in encouraging root growth of young plants. It is best dug into the soil before seed is sown or plants are set out and it should be a component of most seed composts. An excess may hasten ripening and in this respect may counteract excess nitrogen. A deficiency is associated with stunting of roots (particularly the lateral fibrous rootlets), restricted growth, and short, thin, upright shoots. If the deficiency is acute, small leaves grow at right angles and finally become bright red, yellow, or purple and early defoliation occurs. Symptoms generally are rather like those of nitrogen deficiency. Common phosphatic fertilisers include superphosphate, bone meal, or bonedust.

Potassium is regarded as important in the general health of the plant, particularly in developing sturdiness and disease resistance. It helps to promote the growth of woody tissues and usually improves texture, colour, and quality. Deficiency symptoms differ somewhat with different plants, but generally they show as restricted growth and short internodes; if the deficiency is severe, the symptoms are die-back of lateral growth, bluish green leaves with loss of green colour between the veins or on the edges, or leaf scorch. Commonly used potassic fertilisers are muriate and sulphate of potash. Wood ash may also contain worthwhile amounts of potash.

Several other elements are required in smaller quantities some in trace amounts—hence the term minor elements—but the soil's natural supply is likely to be maintained by the amounts of these minor elements present in organic manure and compost and by the impurities in manufactured fertilisers.

SOW AND PLANT

Hardy vegetables needed during summer and autumn. Toward the end of the month or in November (except in mild northern districts of the North Island) sow winter greens such as savoy cabbage, broccoli or winter cauliflower, kale or borecole, and Brussels sprouts.

Frost-tender Vegetables

Toward the end of the month except in districts subject to late frosts sow cucumbers, pumpkins, marrows, melons, sweet corn, dwarf and runner beans.

Plant tomatoes and potatoes.

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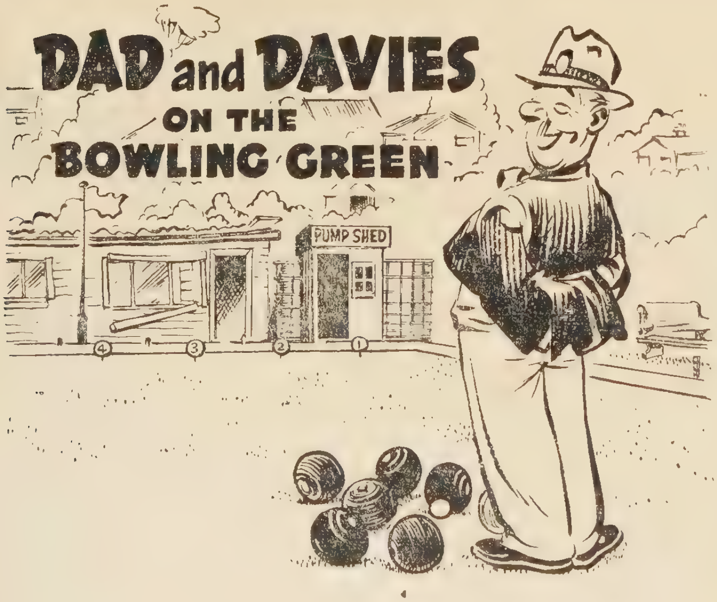

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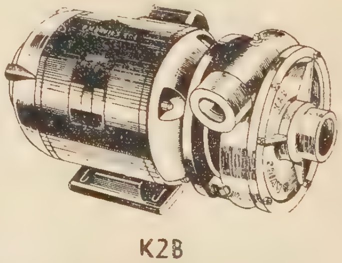

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Pumpkins and similar plants can be raised under glass in waxed cardboard pots such as these ready for setting out in late October or as soon as the ground has warmed enough and the danger of frost has passed.

A suitable complete fertiliser for the home garden is one which contains the three major elements nitrogen, phosphorus, and potash, in the ratio of 1 : 2 : 1. This may be bought already made up or the separate ingredients can be mixed at home. A suitable mixture is as follows:

	Parts by weight
Blood and bone	7
Superphosphate	7
Dried blood	2
Sulphate of ammonia	2
Sulphate of potash	2

This should be applied at 4 oz per square yard and lightly cultivated into the soil before sowing or planting. Leafy vegetables such as brassicas, spinach, and lettuce have a higher nitrogen requirement than root vegetables and will benefit by a side dressing of sulphate of ammonia at ½ oz per yard of row applied about one third of the way through the growing season.

If whiptail disease of cauliflowers is known to have occurred in the garden, it is advisable to substitute molybdenised superphosphate for ordinary superphosphate in the above mixture.

Plant Protectors

Good use can be made of cloches and frames and of special plant protectors or caps of waxed bleached paper or linen. Plastic film, too, is especially useful. Even the very thin plastic film which is made up into containers for fruit and vegetables and widely used in shops can be used for the protection of early crops. Plastic film is now fairly generally available in long sheets of up to about 40 in. wide and in different thicknesses.

The finer gauges of plastic film are transparent and the heavier opaque, but any of it can be made up into squares or rectangular sections for frames, lights, or cloches of various types. The material may be used in place of glass in a glasshouse.

Frost-tender Vegetables

A good way to obtain early crops where there is danger of frost until late October or even November is to sow such tender plants as pumpkins, marrows, and cucumbers on a hotbed under glass or under one or other of the plant protectors already described. An electrically heated hotbed is excellent, though a hotbed of fermenting manure, hops, or other organic material is easily made from suitable material.

The recognised safe dates for planting out frost-tender vegetables vary considerably according to district. As about a month of favourable conditions is required to raise seedlings of most cucurbits (pumpkins, etc.) to a size where they can be planted out, time of sowing must be correlated with the facilities available for raising the plants and the time of the last killing frost. It is not advisable to sow too early, as cucurbits do not transplant readily, and difficulty in transplanting and the resultant setback are greater when the plants are large.

In a few parts of the North Island frost-tender vegetables such as dwarf and climbing beans and cucurbits can be sown outdoors by about mid September, but in most districts it is necessary to defer sowing until late October or even early November. Even where protection can be given against frost nothing is to be gained by sowing in cold, wet ground.

Beans

Beans are one of the most important vegetables and many kinds and varieties are available. All varieties except broad beans are frost tender and require comparatively warm conditions for germination and growth. In districts not subject to late frosts an early sowing of either dwarf or climbing beans can be made from early October, according to the district, though in most districts the end of October or early November is preferred.

Successional sowings can be made as needed until about the end of January in most districts. Whether runner, climbing, or dwarf beans are grown usually depends on the space available. Climbing beans, if well grown, yield more heavily and over a longer period than dwarf, and the stringless climbing varieties are not inferior in flavour and quality to the best dwarf varieties.

Beetroot

A successional or main-crop sowing of beetroot can be made now. Beet is a rather sensitive crop and temperatures should be reasonably high or a high percentage of plants is likely to go to seed prematurely. If plants are exposed for a month at temperatures of 40 to 50 degrees F, they are likely to seed the first year; even growing them at temperatures of up to 60 degrees F is likely to produce seed heads the first year, though the plant is a biennial, normally producing its seed head the second year. Early sowings are therefore usually confined to the flat, deep oblate, or round types, which are harvested early.

Seed should be sown thinly to avoid the necessity for thinning. Beet are likely to be lopsided if crowded, but fairly large thinnings may be pulled and the tops used as beet greens. The method often practised overseas of thinning again later by pulling alternate plants and cooking them complete with tops as baby beets is not favoured much in New Zealand.

The flat and round types of beet quickly deteriorate if left after maturity, but as both the top and root of all types of beet wilt more quickly than those of almost any other root crops, special care must be taken in handling and storage. Early beets are generally used after they reach about 1½ in. in diameter and successional sowing is almost imperative for first-rate quality.

Beet is often judged to a great extent by its colour, and good varieties that should develop a rich colour sometimes fail to do so. This is especially disappointing where the roots are to be exhibited at a show and is usually caused by certain environmental conditions, the chief of which is temperature.

Sowing

Though it is not usually necessary for main-crop sowings, soaking the seed in water for 24 hours will bring about improved germination, which is particularly important with early sowings. Beet seed is about ⅛ in. across and a "seed" may be one or several

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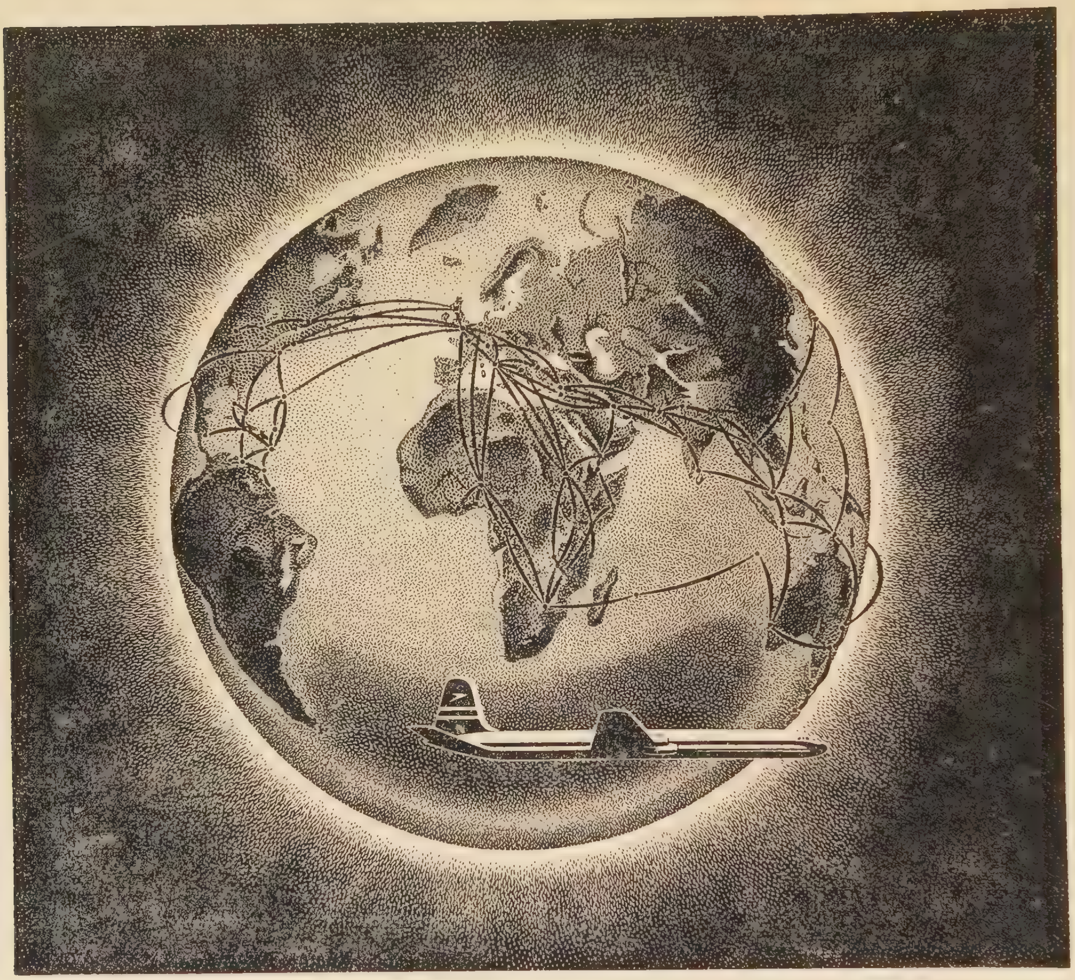

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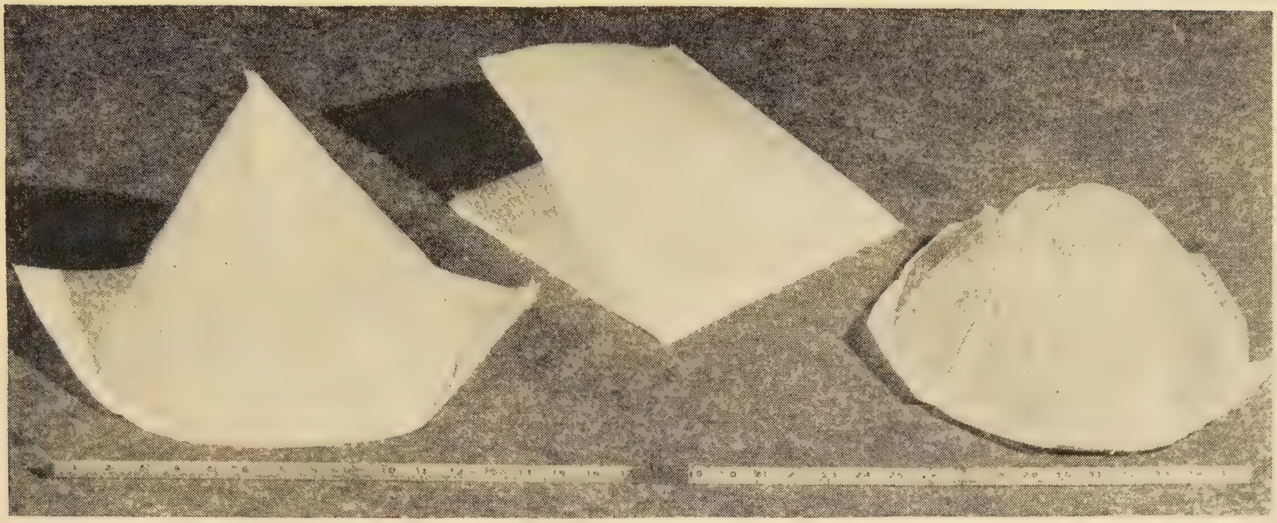


[Sparrow

Protection against a few degrees of frost can be given by using paper caps as shown, frames, cloches, or plastic film stretched over wire or wooden laths.

seeds in a cluster or seed ball, depending on whether it was formed from one or several flowers. Even with thin sowing, therefore, there may be thick emergence because of the germination of several attached seeds.

Seed should be sown ½ in. deep in rows 12 to 15 in. apart and the roots thinned where necessary to 2 to 4 in. apart in the rows according to the size of the fully grown beet.

Soil and Manure

Soil and manurial requirements are generally similar to those for carrots, though beet is very much more sensitive to soil acidity. Lime, applied preferably some time before sowing, is usually necessary on soils not recently dressed. From 3 to 4 oz per square yard worked in some time before sowing usually gives satisfactory results.

Too much lime should not be applied, as the element manganese becomes unavailable when the soil is very alkaline, and beets are very sensitive to manganese shortage. Beets suffering from manganese shortage can be recognised by the chlorosis (lack of green colouring matter) of their leaves.

Boron deficiency, manifested by internal breakdown, may also occur on alkaline soil in dry seasons. Beetroot requires plenty of moisture during growth. It transplants well if carefully lifted and replanted into moist soil, and if thinnings are replanted, they usually mature very little later than the rows from which they were lifted.

The highest-quality beetroot are grown in the lighter soils. Results are best where heavy dressings of organic manure were applied to the previous crop, though on poor soils moderate dressings of well rotted organic manure can be thoroughly worked in when soil is being cultivated to the fine tilth which is desirable before sowing.

The need for application of additional plant food depends on the soil, but if an artificial fertiliser is required, one with a ratio of 1 part of nitrogen, 2 to 4 parts of phosphoric acid, and 1 part of potash applied at 1½ to 3 oz per square yard is likely to suit a very wide range of conditions. The situation for beetroot should be open and sunny, as it rarely thrives if shaded, even if soil conditions are perfect.

Varieties

Flat: Flat Egyptian.

Short top (flat at the top or bottom with sides rounded): Crosby Egyptian, Early Wonder, Light Red Crosby.

Deep oblate to round globular or oval: Crimson Globe, Detroit Dark Red. Greentop Bunching, Early Wonder, Crimson King.

Half long: Half Long Blood.

Long: Long Dark Blood.

Non-bleeding beet, which does not bleed when cut, is favoured by many, as it retains its colour even when cut into pieces before cooking.

Carrots

Carrots can also be sown in October. Their culture was discussed in last month's "Journal".

Cabbages and Cauliflowers

An October sowing of quick-maturing cabbages or cauliflowers should produce heads for cutting within about three months. Where temperature, moisture, drainage, and sufficient plant foods are available quick-maturing varieties of cabbage should reach usable size in less than three months. Quick-maturing varieties of cauliflower usually require a little longer, even in favourable conditions, but both vegetables respond to rich soils, ample moisture with good drainage, and moderate to fairly high temperatures.

Continuity of supply can be assured in most gardens by regular successional sowing of varieties having similar maturity periods or with cauliflowers by sowing different varieties which have maturity periods varying from about three and a half to about seven months.

Popular varieties of cabbages include Golden Acre (early), Copenhagen Market Slowbolt (slightly later), and Green Acre.

Good varieties of cauliflower include Walcheren, All Seasons (All The Year Round), Early London, Phenomenal (four months), Phenomenal (five months), and Phenomenal (six months).

Lettuces

Lettuces thrive in cool, fertile, well drained soils which should be rich in organic matter. As the seed is small and germination relatively weak, cultivation should be thorough. Fairly heavy applications of organic manure are advisable on most soils, but very rapid growth as the result of too much nitrogenous manure being available may lead to tipburn (dying back of leaf edges).

The soil must retain its moisture well, but drainage should be good and on areas that are inclined to be wet lettuces should be grown on a raised bed. Fertiliser needs vary greatly according to the type of soil and its condition, but where insufficient rich organic manure is available a fertiliser containing nitrogen, phosphorus, and potash is recommended. As the plants should be kept growing steadily, side dressings of nitrogenous fertiliser such as sulphate of ammonia, nitrate of soda, or dried blood may be advisable.

Early in the season plants are usually set out, but when conditions become hot and dry, it is often better to sow seed where the plants are to mature. Seed should be sown thinly ¼ in. deep in rows 12 in. apart and the plants thinned to 8 to 12 in. apart in the rows.

Varieties: Good varieties for sowing in October include Triumph, Imperial 847 (summer), Imperial 44, Neapolitan (Webbs or New York), and Great Lakes.

Onions

In most South Island districts it is usual to sow main-crop onions in September. If this has not been done, a sowing should be made without delay as advised in last month's "Journal". Established crops should be kept cultivated and weed free.

Peas

Peas do well in cool, well drained soils rich in humus. The ground should be deeply dug and manured, preferably some time before sowing, with organic material such as compost or farmyard manure. Before sowing, a complete fertiliser, or if the soil is in good condition a dressing of 2 to 3 oz of superphosphate to the square yard, can be well worked into the soil.

If a shallow trench is first taken out and the seed pressed into the bottom of it 1 to 1½ in. deep (according to whether the soil is heavy or light), the plants can be earthed up conveniently as soon as they show a tendency to straggle or fall over between the rows. Dwarf varieties such as William Massey and Little Marvel can be grown without staking in rows 20 in. apart, if they are kept well earthed up.

Rows of the mid-season varieties such as Greenfeast and Victory Freezer should be planted at least 3 ft apart and require staking. Material such as brushwood, netting, or sticks can be used. Vines must be supported so that they will not provide a refuge for slugs, which eat the pods. Staking also prevents the pods from rotting through contact with the soil.

The varieties mentioned are among the best. One pound of pea seed is sufficient for about 100 ft of row.

Potatoes

Main-crop potatoes are planted in most districts in October. Their culture was discussed in last month's "Journal".

Tomatoes

Most varieties of tomatoes are damaged by more than a few degrees of frost and plants that have been raised under glass are usually particularly susceptible, as they are rarely as fully hardened off as they should be. Except in a few northern districts tomatoes are usually set out in the field toward the end of October, though on level areas such as the Christchurch district, which tends to be low lying and is not on the coast, planting may have to be delayed until about the second week in November.

Soil preparation should begin early. A deeply dug, well drained soil rich in humus and a warm, sheltered situation having the maximum amount of sunshine are best. Plants for setting out should be sturdy, erect, 6 to 8 in. high, and free from disease. The foliage should be an unblemished dark green and the bases of the stems a dark purple which as it extends upward gradually merges with the natural green of the plants.

Choice of Plants

It is advisable to obtain plants from a grower who uses sterilised soil, who takes other precautions against disease, and who does not crowd individual plants in the boxes so that they are thin and weak. Diseased plants will be an endless source of worry to the grower and are usually best destroyed. Similarly, plants that have weak rooting systems or are thin and starved will suffer a severe check after being planted out, particularly if the weather is unfavourable, and valuable time will be lost while they are recovering.

Hardening off should be done at home if the plants bought are tender and the weather is uncertain. Plants should be hardened off by gradually increased exposure to conditions similar to those in which they will finally be planted out.

Unless dwarf varieties are to be grown, provision must be made for supporting the plants. They can be staked individually or tied to wires supported by end posts; occasionally tall varieties are grown on two stems.

Acid or heavy soils should usually be limed, preferably the previous autumn, at 3 to 4 oz a square yard, but on certain soils and particularly in high-rainfall areas lime can be applied at twice or three times this rate. It is preferable to apply moderate dressings at relatively short intervals than very heavy dressings at long intervals.

Manuring and Planting

Well rotted organic material such as farmyard manure or compost is recommended for most garden soils, but it should be thoroughly mixed with the soil a considerable time before planting. Where additional fertiliser is necessary a balanced dressing should be applied.

Dwarf plants should be set not less than 2 ft apart in the rows and other types 12 to 15 in. apart. Rows should be 36 to 48 in. apart.

Varieties

Good dwarf varieties are Stoner's Dwarf Gem, Adelaide Dwarf, Marglobe, and Early Chatham. Staking varieties include Beefsteak, Kondine, Best of All, Carter's Sunrise, Potentate, Moneymaker, and Stoner's Prolific. Numerous other good varieties are listed in most seedsmen's catalogues.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during May 1959 and for the 10 months ended 31 May 1959 with comparative figures for the same month and the 10 months of 1957-58 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.
May 1959	3,861	110	3,971	—
May 1958	3,841	129	3,970	—
Increase or decrease	20	—19	1	0.025
10 months ended 31/5/59	174,685	2,700	177,385	—
10 months ended 31/5/58	170,872	2,856	173,728	—
Increase or decrease	3,813	—156	3,657	2.105

Butter in store at 31 May 1959 was 33,114 tons

CHEESE

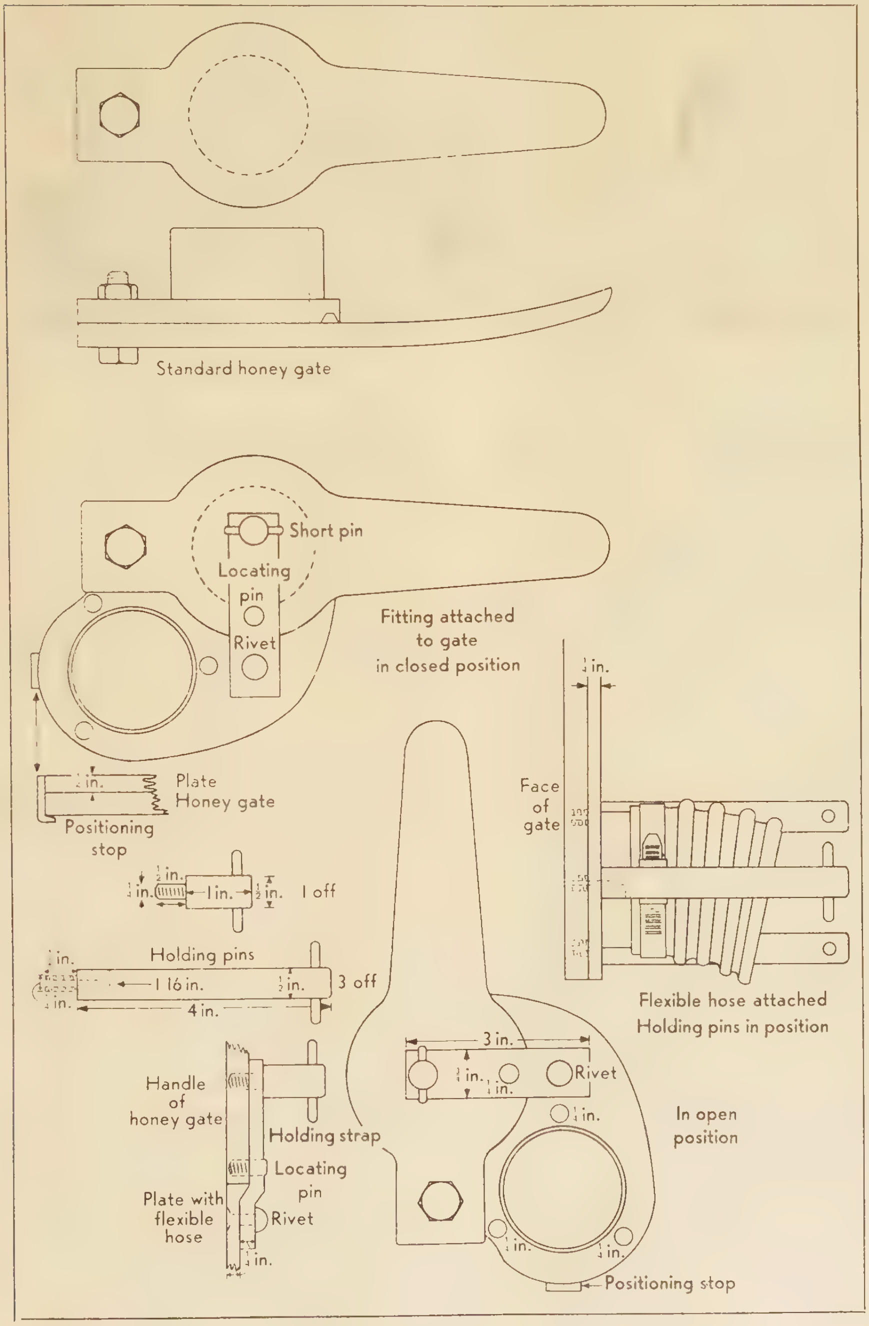
Period	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
May 1959	4,260	6	4,266	—
May 1958	4,317	524	4,841	—
Increase or decrease	—57	—518	—575	—11.878
10 months ended 31/5/59	65,611	13,429	79,040	—
10 months ended 31/5/58	76,630	13,250	89,880	—
Increase or decrease	—11,019	179	—10,840	—12.06

Cheese in store at 31 May 1959 was 19,165 tons

If these figures are converted into butterfat equivalent, there is a decrease of 0.572 per cent in butterfat graded for the 10 months as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place they are not necessarily a true indication of production trends.

Honey Gate Fitting for Transfer of Honey from One Tank to Another

WHEN honey is being packed for retail sale it is usually necessary to transfer it from one tank to another. In this article A. W. Bennett, Apiary Instructor, Department of Agriculture, Hamilton, describes a fitting to the honey gate of a tank that was designed by Mr J. Hishon, Morrinsville, and which overcomes the need to fit a gate valve to each tank.


Standard honey gate
Short pin
Locating pin
Rivet
Fitting attached to gate in closed position
Plate
Honey gate
Positioning stop
1 in.
1 off
Holding pins
1 16 in.
4 in.
3 off
Face of gate
Flexible hose attached
Holding pins in position
Handle of honey gate
Holding strap
Locating pin
Rivet
Plate with flexible hose
3 in.
Rivet
In open position
Positioning stop

BECAUSE honey put on the local market today needs to have a very fine, smooth grain, most packers have installed in their honey houses a cool room or a refrigerated or cool tank to obtain the necessary quick granulation of their honey.

This often entails the movement of honey by a honey pump after the starter has been added to it from the settling tank to a tank which is either refrigerated or wheeled into the cool room. When the honey is ready to be packed it is again pumped into the packing tank.

The fitting consists of a piece of ¼ in. iron plate of about 6 in. x 4 in. smoothed off at the back to correspond with the fixed portion of the gate on the tank and shaped to fit under the handle part or front of the gate (see drawing). In this plate is cut a hole to correspond with the hole or bore of the gate. Over this hole is welded a metal tube about 2 in. long and the same diameter inside as the hole. If desired, this metal tube can be built to form a right-angle bend and then welded in place.

Over this metal tube is pushed a piece of corrugated flexible rubber hose as used on some car radiators and held in place tightly by a standard screw clip. About 24 in. of this rubber hose will give plenty of flexibility to meet the requirement in most honey house pipe lines (see drawing).

To hold the plate in position a piece of strap iron is required about 3 in. x ¾ in. x ¼ in. thick in which three holes are bored and bent to offset the variation in the thickness of the ¼ in. iron plate and the thickness of the movable part of the gate so that the backs of both are flush. Rivet the holding strap to the iron plate. Place the plate in position and carefully mark the holes for the locating and short holding pin on the movable part of the gate, drill, and thread as in drawing. The positioning stop can now also be attached to the iron plate. Now mark positions of the three long holding pins, bore, and thread these as in drawing.

Short Holding Pin (1 Required)

A piece of ½ in. round rod about 1½ in. long is required, machined as in drawing.

Long Holding Pins (3 Required)

Three pieces of ½ in. round rod about 5 in. long are required and are machined as in drawing. The screw part has a 1/16 in. hole drilled down its length with an outlet to meet it in the shank of the pin to allow any honey trapped in the blind tapped holes in the fixed portion of the gate to escape; otherwise it would be difficult to screw the pins up tightly.

Sizes may have to be adjusted to suit individual honey gates.

Other honey gates can be treated in the same way by the boring of the five necessary holes.

[Elliott

POLYANTHUS and PRIMULA

POLYANTHUS and primula are some of our most useful winter and spring flowering plants. They are easy plants to grow if the conditions are correct and in this article J. P. Salinger, Horticulturist, Department of Agriculture, Wellington, describes the culture of the common types.

THE genus *Primula* contains more than 500 species, with numerous varieties, but not more than a dozen species and varieties are commonly grown in New Zealand.

Botany of the Primulas

The primulas are fairly distinct botanically and they have a good many features in common. All the flower stems spring from a basal rosette of leaves, the flowers are usually in heads or trusses, and often some or all parts of the plants are covered with white wax, called farina.

The detail of the flowers is also interesting, as they are designed for cross pollination. In some plants the tip of the female parts, the stigma, reaches the level of the petals while the anthers are below the stigma; these are called "pin-eyed" flowers. In "thrum-eyed" flowers the anthers are level with the petals and the style and stigma are beneath them in the tube of the flower. The seeds are small and usually germinate best when they are fresh and sown as soon as gathered.

HEADING PHOTOGRAPHS: Left—A polyanthus plant potted into a bowl for decoration indoors. Right—Polyanthus interplanted among narcissus.

Primula obconica occasionally causes dermatitis to people susceptible to skin rashes, especially if handled when wet. Barrier creams should be applied before they are handled or antihistamine cream applied if a rash develops.

Types for garden use can be divided into five sections:

Spring bedding plants
Pot plants
Rock garden plants
Bog garden plants
Dwarf perennials

Some types will be suitable for more than one purpose, but in general most of the commonly grown types fall into one category.

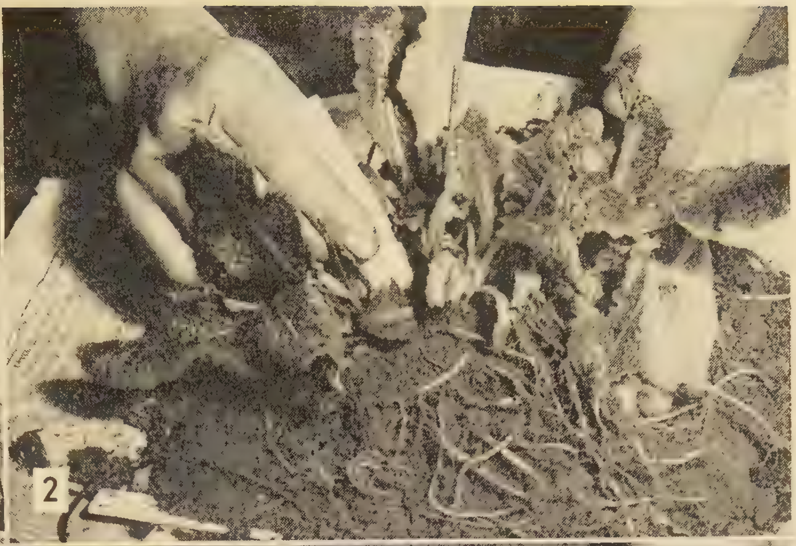
Probably the most popular type of primula is the polyanthus, which has been bred and selected especially in this country and is now considered indispensable for a spring display.

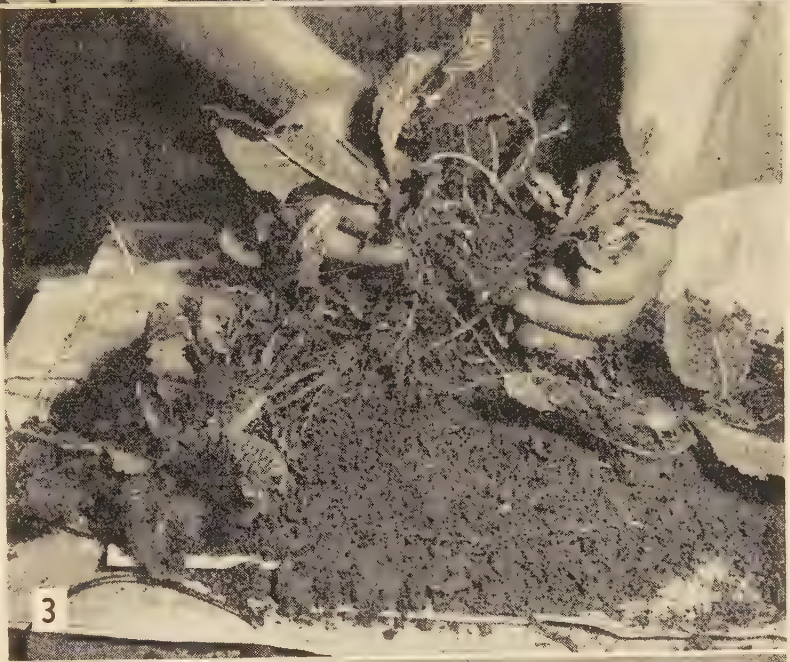
Cultivation of Polyanthus

Polyanthus are grown as spring bedding plants in all parts of the country. They are hardy plants, but have definite cultural preferences. The soil should be fertile and well enriched with rotted organic matter such as old manure, decayed compost, or leaf mould. Though they can be planted to flower in an open, sunny position, the plants grow best in the warmer areas in a slightly shaded position where they are protected from direct sunshine in the afternoon. They are not quite so satisfactory for the warmest parts of the country.

Plants are usually raised from seed each year, but plants which have flowered can be grown on for several years if treated correctly.

As the seed is small and must not be sown deeply and the plants are grown during the heat of summer, it is necessary to select an area pro-





POLYANTHUS DIVISION: 1—A two-year-old clump lifted and ready for division. Polyanthus should always be lifted with plenty of soil retained round the roots. 2—Separating the clump into individual crowns by prising them apart with a wooden label. 3—Two crowns are carefully pulled apart. 4—The original clump now divided into four separate plants. These plants will now be set out in a nursery bed in a shaded position to grow on for autumn planting.

tected from direct sunlight for raising the plants.

Late summer or early autumn is the correct time for planting seedlings to obtain satisfactory flowering the same season. If purchased in winter or spring, they will not flower well the same season and will need to be grown on during summer for flowering the following year.

Unlike many other plants they can also be safely planted when in flower, provided they are lifted with plenty of soil on the roots.

Raising from Seed

Fresh seed from a good strain should always be used. It is possible to obtain types true to the various colours, such as yellow, bronze, blue, or mixed pastel shades. Occasionally a "gold laced" type can be obtained in which the margins of the petals are banded with gold. The seed is usually sown in October or November or as soon as it is gathered in a seed box of well prepared soil. Alternatively the seed can be sown in a shaded cold frame in specially prepared soil.

A suitable soil mixture for the seed box or frame is:

2 parts of loam or good garden soil
1 part of peat, leafmould, or old manure
1 part of coarse sand

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★ **DESTROY FOOD...**
★ **CAUSE WASTE...**

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3. Do not overfeed poultry or birds at night.
4. Burn all garbage or place in *covered* dustbins.
5. See that all rubbish is cleared away frequently.
6. Rat-proof your premises.
7. Demolish old unused buildings.
8. KILL ALL RATS—Lay poison or set traps.

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PROTECT YOUR CHILDREN • PROTECT YOUR PROPERTY

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To each bushel of this mixture 2 oz of blood and bone and 1 oz of superphosphate should be added.

To suppress weeds and control soil-borne diseases it is advisable to sterilise the loam or garden soil. If this is done by heating, it is important that these materials only are sterilised before they are mixed with the other ingredients, as, if the complete mixture is sterilised, chemical interaction may take place. In such cases ammonia may be produced and this will definitely inhibit the germination of the seed or cause a stunting and yellowing of the seedlings.

The soil mixture should be passed through a ¼ in. sieve, with the surface soil passed through a ⅛ in. sieve. The seed box should be filled with loose soil to the top, well firmed with the fingers, and the surface made flat and level with a piece of board. The seed should be carefully and thinly sown on the surface and a very light dressing of sieved soil sprinkled over it.

Clean sieved sphagnum moss can also be used to provide a seed sowing surface and to cover the seed.

After sowing the seed the box should be placed in a shallow bath of water to remain until the moisture reaches the surface. The box should then be covered with a piece of glass and a sheet of newspaper and stood on a shaded glasshouse bench, in a cold frame, or outside in a protected place facing north-east. The glass should be lifted and turned each day and as soon as the seed has started to germinate the paper should be removed and one edge of the glass propped up. It can be removed entirely three or four days later. If watering is needed, the box should either be placed in a shallow bath of water or a fine rosed watering can used.

Seedlings should be pricked out into other boxes as soon as two true leaves have formed. The same soil mixture can be used, but the added fertiliser should consist of a mixture of 2 oz of dried blood, 2 oz of superphosphate, and 1 oz of sulphate of potash per bushel of mixture.

The boxes should be placed in a partially shaded position outdoors and kept well watered. Occasionally the young plants are attacked by a leaf spot disease caused by the fungus *Ramularia primulae*. This can be controlled by spraying with thiram fungicide.

In warm, moist weather plants may be attacked by soft rot disease caused by *Erwinia carotovora*. The leaves become a leaden colour and a rot develops. It can be controlled partly by watering or spraying with bordeaux mixture.

Planting out

The young plants should be ready for planting out at any time in March or April depending on the availability of the site and the size of the plants. In the colder areas the earlier time is preferable. After the removal of summer bedding plants the soil should be forked over, well rotted organic matter worked in, and a dressing of dried blood at 4 oz per square yard or blood and bone at 6 oz per square yard applied. If the soil is dry, it should be thoroughly soaked with water before planting. If the plants are large and the area not prepared, they should be grown on in a reserve area for planting when in bud.

Plants will continue to grow through the winter in milder areas and will flower from August on. Birds and especially sparrows frequently damage the flowers. This can be prevented by placing wooden pegs or skewers round the bed and stretching black cotton between these above the level of the leaves.

Unless required for seed, dead flower heads should be regularly removed. The display can be sustained by watering if the weather is dry.

Treatment after Flowering

By November, however, the plants will have finished flowering and the area will be required for summer bedding. The plants need not be discarded, as they can be grown on in a reserve area. This site should be shaded from direct sun and the soil well enriched with rotted organic matter. The plants should be lifted with a fair amount of soil on their roots and the separate crowns divided into individual plants. The crowns can be gently prised apart by hand and this is better than using a border fork or chopping them into pieces. The individual plants should be set out about 9 in. apart and watered in if the soil is dry. They will require further watering during summer.

These plants should be sprayed with malathion to control aphids, red spider mite, and leaf roller caterpillar during summer. Thiram can be mixed with this if leaf spot is present.

It is seldom desirable to retain the same parent stock of polyanthus plants for more than three years, as they can be a permanent host for the virus disease cucumber mosaic. Fresh stock should be raised from seed.

Use of Polyanthus

Though a bed of polyanthus by itself can provide an excellent display, these plants are useful for combining with other spring flowering plants. Where daffodils or tulips are planted for an annual display only, a most attractive bedding scheme can be obtained by planting the bulbs about 6 in. deep and setting out polyanthus between them. The colours can either blend with those of the bulbs or contrast with them.

As cut flowers polyanthus are particularly useful, as they are very bright and last well when gathered. In cold districts early blooms can be obtained by setting the plants in a cold frame or covering them with cloches.

Other Spring Bedding Primulas

Where frosts are not severe or prolonged *Primula malacoides* and *P. obconica* are both excellent types for spring flowering. They are less exacting than polyanthus in their requirements, though *P. malacoides* flowers best and frequently seeds itself in shady, moist areas. Plants may be raised in the same manner as polyanthus, but the seed need not be sown until December or January. The young plants can be set out in late March or April. Provided the soil is reasonably fertile, it is only necessary to add a dressing of 4 oz of blood and bone per square yard. After flowering the plants should be discarded, as they cannot be grown on from year to year.

Primula wanda is a dwarf perennial plant like a purple primrose. Plants are normally increased by division. In cold districts it can be used to make a miniature bedding display or ground cover beneath early flowering shrubs such as forsythia or witchhazel.

Pot Plants

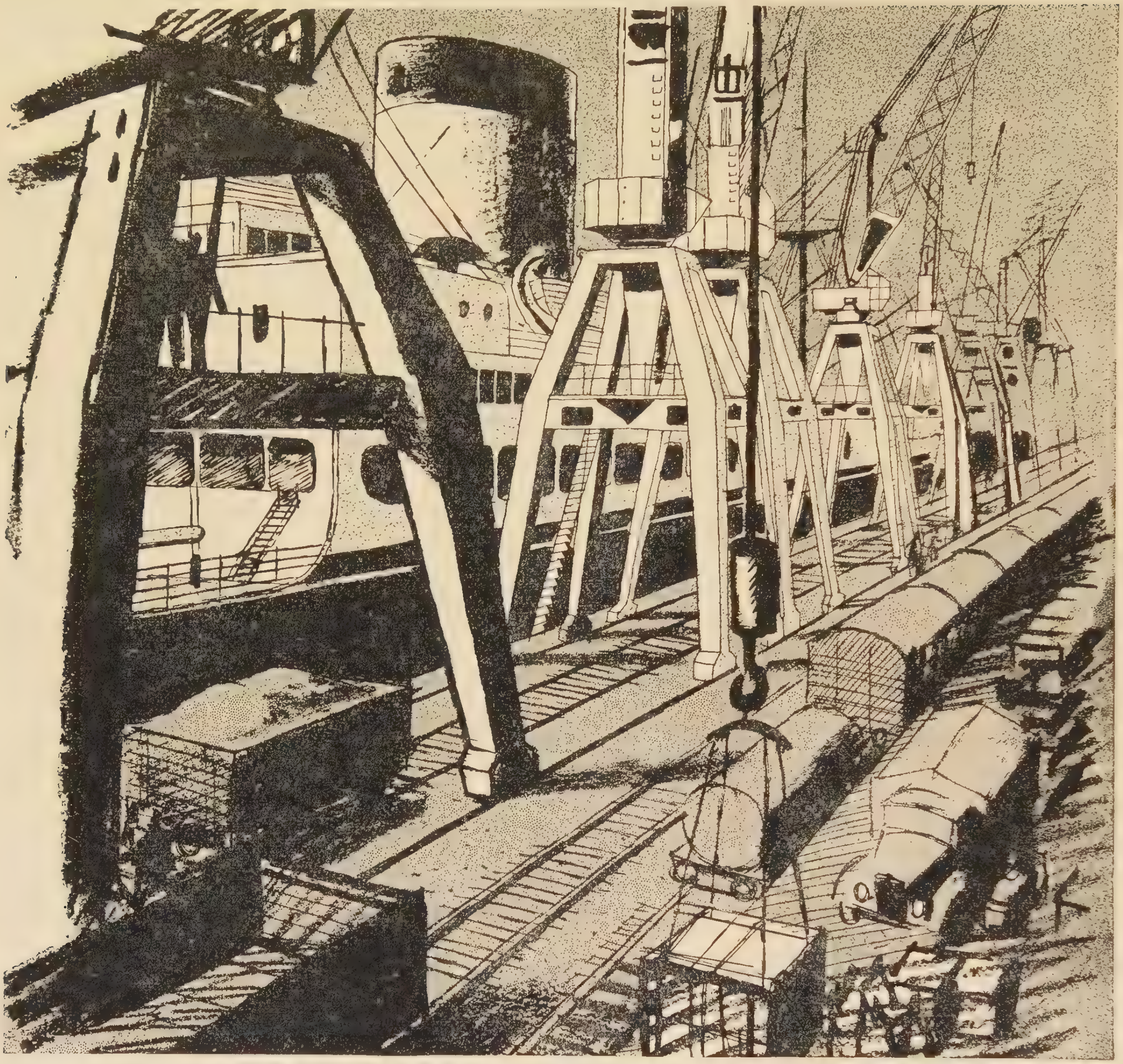
Flowering pot plants are especially useful in winter and for this purpose *P. malacoides*, *P. obconica*, *P. sinensis*, *P. sinensis stellata*, and *P. kewensis* are used.

Seed is sown from November to January and treated in a similar way to polyanthus. When the seedlings in boxes have grown so that the leaves nearly touch they should be potted on into 4 in. or 5 in. pots for final flowering. The pots should have adequate drainage provided by crocks and over these a layer of half-rotted leafmould or manure is placed. The soil mixture is the same as for pricking out.

Once the plants have rooted in the pots, these should be placed in a shaded frame outside or on shaded benches in the glasshouse. If the flower trusses are very heavy, the stems may need tying to a small split bamboo cane, but the top should be kept below the level of the flower heads. The plants require adequate water and by mid winter can be allowed almost full sunlight. If aphids appear, they should be controlled by spraying with an aphicide or by fumigating the glasshouse with lindane.

There is a wide range of colours especially in the *P. obconica* and *P. sinensis* types, while *P. malacoides* can be obtained in colours from pale mauve to deep red, including a double one; *P. kewensis* is a pure yellow.

YOUR MARKETS OVERSEAS • NO. 3 OF A SERIES



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Plants of polyanthus, primrose, and dwarf species can be planted in bowls when in flower. If the soil surface is covered with living mosses, very attractive miniature gardens can be made.

Rock Garden Species

Many of the dwarf species are suitable for growing in rock gardens. They do not spread rapidly, remaining as compact clumps, so they should be planted away from spreading or creeping plants. They combine well with bulbous flowers and prefer a neutral or slightly acid soil rather than an alkaline one. If the plants are surrounded by small stones, they will remain freer of weeds and will neither rot in winter nor suffer unduly from summer heat. In the milder areas *P. malacoides* can be planted to give colour in winter.

Species suitable for rock gardens are *P. denticulata*, *P. juliae*, *P. wanda*, and single and double primroses.

Bog Garden Types

The majority of candelabra primulas are excellent early summer flowering perennials which grow best in moist soil and with light overhead shade. Seed should be sown in spring, the same practice as with polyanthus being followed, and they should be planted in autumn. They are suitable for planting round the moist margins of garden pools or along the edge of a creek, especially if it is not heavily shaded overhead by trees and shrubs. They can also be grown in moist soil in a shady position, without water actually being present. The soil should preferably be improved with rotted compost or leafmould.

Suitable species are *P. japonica* and *P. pulverulenta*. There are also several other species grown in this way in Europe. *P. denticulata* will also grow in similar positions as well as in drier soil.

Dwarf Perennial Types

Though not suited for growing in a mixed border, several of the smaller types can be grown in the same position for several years. Single and double primroses, *P. juliae*, *P. wanda*, and *P. auricula*, are suitable for this purpose. Primroses, preferring a shaded position, can be planted under a bed of fuchsias or bordering a shaded path. In the warmer areas dahlias are often left in the same position for several years, and if planted deeply, the primroses can be grown among them to flower before the dahlias appear above the soil. The dahlias later in the season protect the primroses from the heat of the sun. An occasional topdressing of rotted compost or leafmould with 4 oz per square yard of blood and bone will benefit both types of plants.

Auriculas do best in cooler climates, apparently requiring a period of definite cold weather in winter. They flower best in well drained soil in a fairly sunny position and the clumps should be lifted and divided every three years after flowering. They are sometimes attacked by slugs or snails, which should be controlled with metaldehyde baits or sprays.

Garden Work for October

By ROSALIE A. CAMPION,
Horticultural Instructor,
Department of Agriculture,
Wellington

Though seed sowing and management of annual plants will take considerable time in October, other tasks must be attended to if a balanced display is to be sustained throughout the season following.

Among the Shrubs

Evergreen plants and any deciduous plants which have been grown in pots can now be planted out. The holes should be well prepared, preferably with the addition of compost, and the plants should be well firmed. In windy areas plants should be staked at planting time, as any movement of roots is detrimental to the growth of all plants. Most plants will benefit from mulching with compost or sawdust to which blood and bone or sulphate of ammonia has been added.

After flowering *Calythrix sullivani*, buddleia, erica, thryptomene, waratah, genista, flowering currant, and forsythia should be pruned to keep the bushes shapely. The seed heads of rhododendrons should be removed after flowering. Now is a suitable time to prune camellias and most evergreens, should this be necessary to retain their shape.

Shrubs which Need Spraying

Leaf-roller caterpillars cause the leaves of many shrubs to look unsightly, as they chew the foliage and roll the leaves or tie leaves together. They shelter between these tied leaves and are thus very difficult to control by spraying. If only a few are present, they can be most easily disposed of by squeezing between the fingers. Where they persist sprays of arsenate of lead should be used. DDT does not control all species of this pest.

The oak-leaf miner is disfiguring most oak trees in the country and it is worth spraying young trees against this pest. Sprays of DDT emulsion used at monthly intervals over the summer, starting now, have given good control.

Many shrub pests are controlled by sprays of the emulsion forms of DDT, lindane, and malathion. These include thrips which cause a silvering of the leaves and ill-thrift in rhododendrons, lauristinus, and clethera (a lily-of-the-valley tree). These insects suck the sap from the undersides of the leaves and excrete a browny deposit. Manuka blight and blackening of boronia are also caused by sucking insects which excrete honey dew on which sooty mould forms. These should be sprayed. Azalea leaf miner burrows into the leaves and causes them to look half dead as, in fact, they are. Spraying of the young foliage will protect them.

Gladiolus

The main plantings of gladiolus should be made successively in October. The husks should be removed from the corms before planting and any small disease scars should be cut out before dusting the area with flowers of sulphur. Badly scarred corms should be burnt. The bulbs should be soaked for one or two hours in "Aretan", dried, and dusted with DDT powder to kill any thrips before planting.

Rhizomes and Tubers

Bearded irises are in full bloom in October and orders should now be placed. The plants are best set out just after blooming. *Iris inomminata* is another species which is deservedly gaining in popularity. It is available in many different colours and markings. Every third year after flowering the plants should be divided.

Cannas could be more widely used in summer gardens, as they are no more tender than dahlias and, like them, flower for a long time. The rhizomes can be treated like dahlias and lifted over winter or given a heavy winter mulch. Plants can now be divided and planted with their crowns just below ground level in good rich soil.

Dahlias which were boxed up previously will now be making growth from which cuttings can be taken and rooted in a mixture of equal parts of sand and sawdust in a cold frame. Alternatively, the tubers can be cut apart with a sharp knife, care being taken to see that each tuber has at least one good shoot. These can be planted out toward the end of October.

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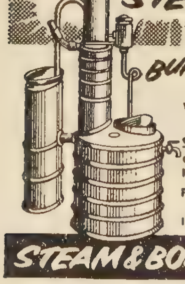

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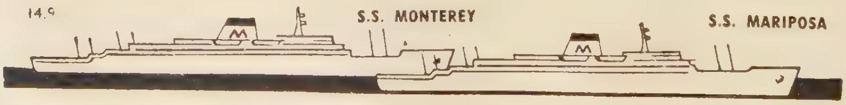

Chrysanthemums

There is still time to lift and divide old clumps. This is preferable to leaving them undisturbed. Cuttings usually root in three to four weeks and once rooted they can be planted in a reserve bed to harden off for planting out toward the end of the month. Before planting, the bed should be enriched with any available organic matter and topdressed with a mixture of 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of sulphate of potash at 4 oz per square yard. To give the best effect the plants should be set out 18 in. apart and in clumps of three or four. In frosty areas planting out is better delayed until November. When the plants reach a height of 8 in. any which have not produced side shoots naturally should be stopped, the top 2 in. of growth being removed to induce more shoots to develop. Well grown plants are not as susceptible to pests and diseases as poorly grown plants, but as a precaution plants should be sprayed every three weeks from planting out with a mixture of ½ fl. oz. of lindane 20 per cent emulsion, 1¼ oz of thiram wettable powder, and 4 gallons of water.

Other Border Plants

All border plants should be given a dressing of balanced fertiliser similar to that recommended for chrysanthemums if this has not already been applied this spring. The spotted leaves of gerbera plants should be removed before spraying against fungi with zineb at 1½ oz to 4 gallons. Large old clumps of gerbera can still be lifted and divided. Variegated arabis, which will now be finishing flowering, is an excellent plant for the front of the border. This can be divided into single rosettes for transplanting when the clumps become too large. Its attractive appearance all the year round and few maintenance requirements make it a very desirable plant. Another useful plant for the front of the border or on rock edges is *Cerastium tomentosum* (snow-in-summer) the grey shoots of which can now be divided. There are many attractive echeverias the offshoots of which can now be planted out.

Carnations

Soil should be prepared for carnations to be set out later in October. Most soils in New Zealand are naturally acid and a dressing of lime will be beneficial. This could be applied at 2 to 3 oz per square yard when organic matter is incorporated. Following this, a mixture of 4 parts of bone dust, 3 parts of dried blood, and 3 parts of sulphate of potash can be worked into the top spit at 4 oz per square yard.

Perpetual flowering carnations such as Rose Clove and Frank Aldritt (Otaki Pink) set out in October should flower next winter. Bushes which were planted earlier to give flowers during autumn can be stopped for the last time. This means breaking off the tip of the shoots, including the top of the stem. The Sim varieties are generally more suited to the North Island and warmer parts of the South Island, while the Melville varieties are more suited to cooler districts.

To combat thrips, aphis, and leaf-spotting fungus plants should be sprayed regularly with a mixture of: 3½ fl. oz. of DDT emulsion, 1½ oz of thiram 50 per cent wettable powder, ½ pint of sticker, for example, skim milk, and 4 gallons of water.

Cyclamen in pots after they have finished blooming can be taken outside and laid on their sides on the shaded side of the house for the summer. For best results next season they should not be allowed to dry out completely.

Annuals

Seed sowing of hardy annuals can be continued outdoors. Those sown earlier should be thinned out and transplanted to other positions. If the growth appears to have stopped, the plants may benefit from watering with weak liquid manure. Fine and tender seeds are better sown in boxes to be ready for planting out in December. They grow better if not sown until October so that they are not checked. An average mixture for seed sowing would be 3 parts of good loam, 2 parts of leafmould, compost, etc., and 1 part of sharp sand.

If these materials are not available, substitutes can be used to give an open mixture which will retain nutrients and moisture. To each bushel of mixture 1½ oz of superphosphate and ¾ oz of lime should be added. When the seed has germinated it should be pricked out 2 in. apart each way into a stronger mixture consisting of 7 parts of good loam, 3 parts of leaf mould, compost, etc., 2 parts of sharp sand, plus 4 oz of balanced fertiliser and ¾ oz of lime per bushel.

Many herbaceous perennials and biennials can be raised from seed sown in October. The fresh seed of polyanthus will germinate very readily if sown as soon as it is ripe.

Bedding Plants

Wallflowers, myosotis (forget-me-nots), calendulas, and other spring bedding plants should be dug out to make room for summer material. Healthy material should be composted. Where bedding is intensive the ground must be generously replenished with organic matter such as compost or animal manure at least once a year between crops. A light dusting of lime (2 oz) and a dressing of a balanced fertiliser (4 oz per square yard) should also be given. The beds should be reasonably firm before planting, as they are likely to sink when the organic matter settles down.

The day before planting out seedlings, whether from a box or from open ground, the plants should be well watered so that the plants are turgid at planting and will receive less check. The plants should be cut out of the boxes so that the roots are not disturbed greatly.

Bedding geraniums which have been in the ground over winter can be pruned back now that risk of frost is passed. Any which have been sheltering in cold frames over winter should be hardened off outside before planting.

Glasshouse and Pot Plants

Rooted cuttings of begonias and gloxinias can be potted up into 3 in. pots. Old cyclamen plants which have finished flowering can be laid on their sides against a south wall for the summer. They should not be allowed to dry off completely.

Most ornamental pot plants will benefit from regular liquid feedings and occasional syringing of the foliage. The leaves do not like being clogged with dust and those with shiny surfaces can be wiped with warm water to which a little summer oil has been added. Leaves with hairy

(Continued at bottom of page 287)

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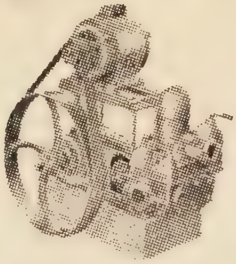

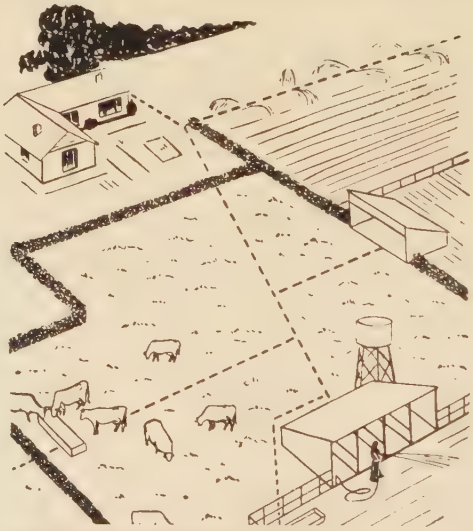

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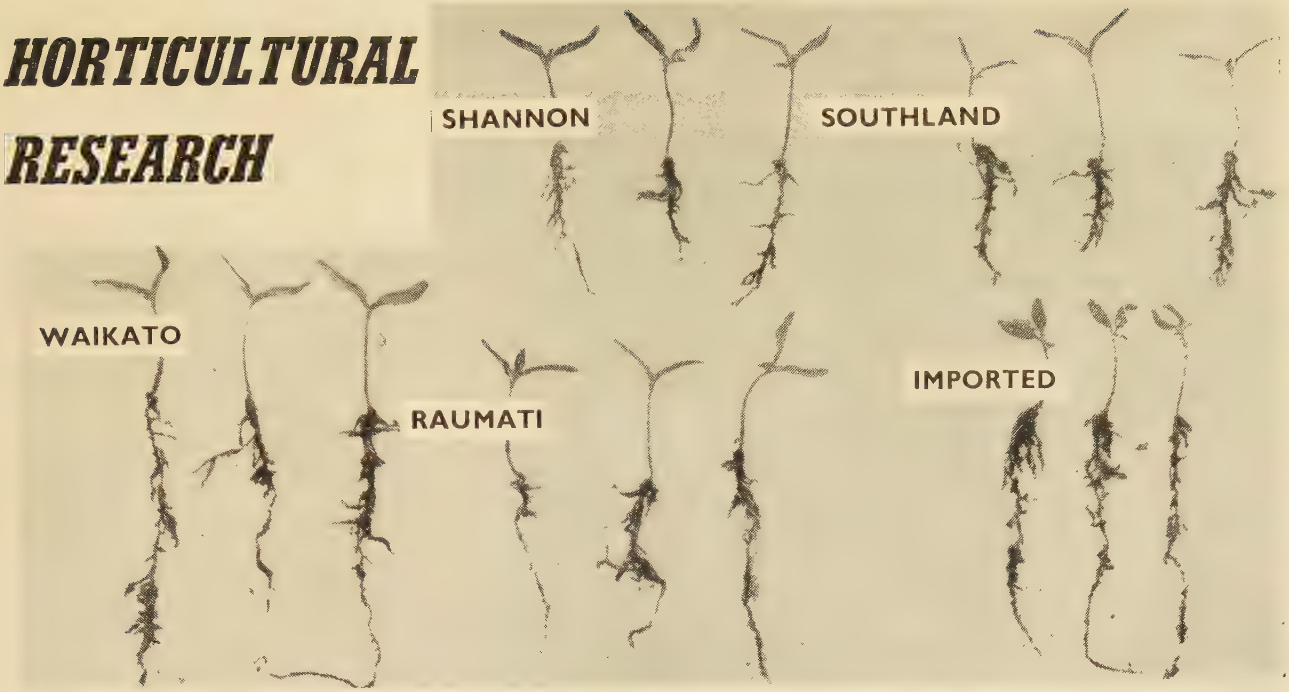


HEADING PHOTOGRAPH: Tomato seedlings from composts containing the peats shown, none of which produced consistently better seedlings.

N.Z. Peats Suitable in Composts and Rooting Media

NEW ZEALAND peats used in nursery composts and rooting media in trials at the Levin Horticultural Research Station of the Department of Agriculture have compared favourably with imported peat. The New Zealand peats were from Invercargill, Raumati, Shannon, and the Moanatuatua swamp near Hamilton, and the imported peat was from Cumberland, England. The pH and nutritional status of the peats were unmodified.

TOMATO seedlings, zinnia seedlings, chrysanthemum cuttings, and azalea cuttings were used in the trials. Seedling and pricking out composts used were based on the John Innes mixes. The rooting medium used for the cuttings was a mixture of 2 parts of peat and 1 part of sand. Physical structure of the composts was indistinguishable, except that the peaty loam from Shannon formed an undesirably compact compost. Chemically the composts were very similar and typical of those used by the nursery industry. Seedlings were grown in each of the seedling composts and then transplanted into each of the pricking out composts containing the various peats so that any effect of a change in peats from seedling to pricking out composts could be observed, but no beneficial result from the change was evident.

Observations were made to assess the effects of the various composts on plant growth; the percentage seed germination in the seedling composts; and root development in seedling and pricking out composts. The weight of the plants from the pricking out composts, root development on the cuttings, and the weight gained by the cuttings from time of insertion were recorded.

Performance of the composts varied in some aspects of the trials, but overall results showed that with the exception of the peaty loam from Shannon the New Zealand peats compared favourably with the imported peat for nursery work.

—*D. A. SLADE, Instructor in Horticulture,*
Department of Agriculture, Auckland

(Continued from page 285)

surfaces collect a lot of dust and can be cleaned with a very soft brush.

Plants can be fed every two weeks with weak liquid animal manure or 6 parts of sulphate of ammonia, 3 parts of superphosphate, and 1 part of sulphate of potash mixed with equal quantities of sand and ½ teaspoon given to each pot.

General

Aphids are numerous on most susceptible plants and especially young rose buds at this time. Lindane wettable powder or malathion sprays should be used against them.

Slugs and snails are also active and poisonous metaldehyde baits or sprays should be used. Where slaters are troublesome DDT dust should be used liberally once the hiding places are cleaned up.

Polyanthus and violets can now be lifted and divided or the polyanthus placed in an inconspicuous place in a cool area. Both these plants are severely attacked in dry summers by red spider mites and appreciate occasional waterings to avoid the dry atmosphere which the mite likes. If necessary, sprays of malathion should be applied to control the mites.

As bulb foliage changes colour it can be removed. Tramping over the tops of the bulbs may help to keep out the narcissi bulb fly which lays its eggs in the tops of the bulbs. Dusting the tops with DDT is also beneficial.

Perennial plants which have developed a mass of young shoots should be thinned by the complete removal of some shoots. Young growth should be supported by stakes as it develops. Looper caterpillars can quickly cause many unsightly holes and even eat the growing tips of many plants. A watch for them should be kept on dahlias, salvias, and geraniums and sprays or dusts of lindane, malathion, arsenate of lead, or DDT applied when necessary.

All dead flower heads should be removed after flowering except where it is desired to save seed or to use the seed heads for flower arrangements.

Climbing ivy, jasmine, and honeysuckle can be trimmed back to the desired shape after flowering.

A Duck Glove Puppet is an Amusing Toy

[*Green and Hahn*

HEADING PHOTOGRAPH: The puppet is easily manipulated by a four-year-old.

CHILDREN have always been fascinated by puppets of all kinds and the duck glove puppet described here by Judith Ferrier, Home Science Instructor, Department of Agriculture, Christchurch, is sure to delight the heart of any child. Though its construction is fairly detailed, it is not at all difficult to make and is well worth the time taken.

THIS duck, the body part of which forms the glove, is made from nylon fur fabric to give it the downy appearance of a young duckling. It is not completely washable because of the small amount of felt and the stuffing used, but the nylon part could be easily cleaned by sponging with warm soapy water and rinsing well with a cloth dipped in clear water.

In the graph each square represents 1 in. To enlarge the pattern to its original size use the scale pattern as a guide and draw it out on paper ruled into 1 in. squares. Cut round the full-sized pattern pieces and paste them on to light cardboard or heavy-quality paper to give greater accuracy in cutting out, especially on the springy fur fabric.

These cardboard pattern pieces can be used over and over again without losing accuracy as paper patterns do.

The eye pieces are shown actual size and can be traced ready for use.

Materials

Materials required are:

Quarter yard of 48 in. nylon fur fabric; small pieces of felt in yellow, black, and white; about one handful of kapok or clean teased wool for the head stuffing (finely snipped fur fabric may be used instead); piece of butter muslin or fine lawn measuring 8 in. x 6 in.; white cotton and embroidery cotton in yellow and black.

Cutting out

From the fur fabric: One body back, one body front, two opposite sides of head, one head gusset, two pairs of inner wings, two pairs of outer wings.

Remember to reverse the pattern pieces to avoid cutting two wings for one armhole or two head pieces for the same side.

Before cutting draw an arrow with a soft pencil on the wrong side of the material in the direction the fur lies. When laying the pattern pieces on the material make sure that the arrows on the pattern point the same way as those on the material. This ensures that the fur will all lie in the same direction and not rub up the wrong way.

Draw round the pattern pieces on the wrong side of the material, then cut round the pencilled outlines using small, sharp, pointed scissors. Cut through only the woven backing and not through the pile itself.

Quarter-inch turnings are allowed on all pieces cut from the fur fabric.

From the yellow felt: Two upper beaks, one lower beak, four feet, two pieces 1 in. x 2½ in. for the legs.

From the black felt: One lower beak, two eye pieces (X in pattern), two eye pieces (Z in pattern).

From the white felt: Two eye pieces (Y in pattern).

To Make up

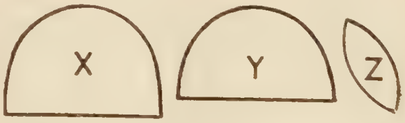
Body and Wings

Tack the fur fabric seams before stitching them. Join the back and front body pieces. With the right sides together and using back stitch join the sides (AB) and the shoulder seams (CD). Stitch the seams on both sides. Neaten the raw edges by overcasting them lightly.

Join the two back wing pieces to the two front wing pieces round the outer edge CB, right sides together. Turn right side out and poke out the ends of the wings with a pencil.

Sew the wings into the armholes of the body matching C and B, easing as necessary.

Turn up a narrow hem round the bottom edge of the body. This is where the hand is inserted to work the puppet.



Pattern pieces for eye (actual size).

Head

Join the gusset to the side head pieces (EF). Stitch the two side head pieces together (EKG).

The top section of the gusset is lightly stuffed to give the head shape and the stuffing is held in place by a piece of muslin.

For this cut a piece of muslin 6 in. x 8 in. and press under a ½ in. seam allowance all round. Run a double gathering thread along each of the four sides. Gather one 6 in. end to fit the nose point and attach it there with a few stitches. Loosely gather the other 6 in. end and attach it to the back of the head across the gusset. Place a little stuffing along the gusset, gather the sides of the muslin to fit the head approximately, and attach loosely to the head seams so that the stuffing is held in place.

Remember that the fingers need plenty of room inside the head to work the puppet and so the stuffing should only be enough to keep the shape of the head. Overstuffing will make it very difficult to turn the head right side out, as the whole head has to be eased through the neck opening.

Turn the head right side out and sew it to the body, matching the body centre front with the head seam EKG. The easiest way to do this is to invert the body over the head so that the right sides are together. It is a good idea to do double stitching to reinforce this seam.

Beak, Feet, and Eyes

As these are all made of felt, the seams are not turned in, but the pieces are joined together with a small running stitch round the outside edge. A fine needle and embroidery thread in a colour matching the felt should be used.

Beak

Place the two upper beak pieces together and stitch HI. Put the black lower beak on top of the yellow lower beak and stitch together.

Join the upper beaks to the lower beaks with the black in the middle (JIJ). The black defines the upper and lower beaks.

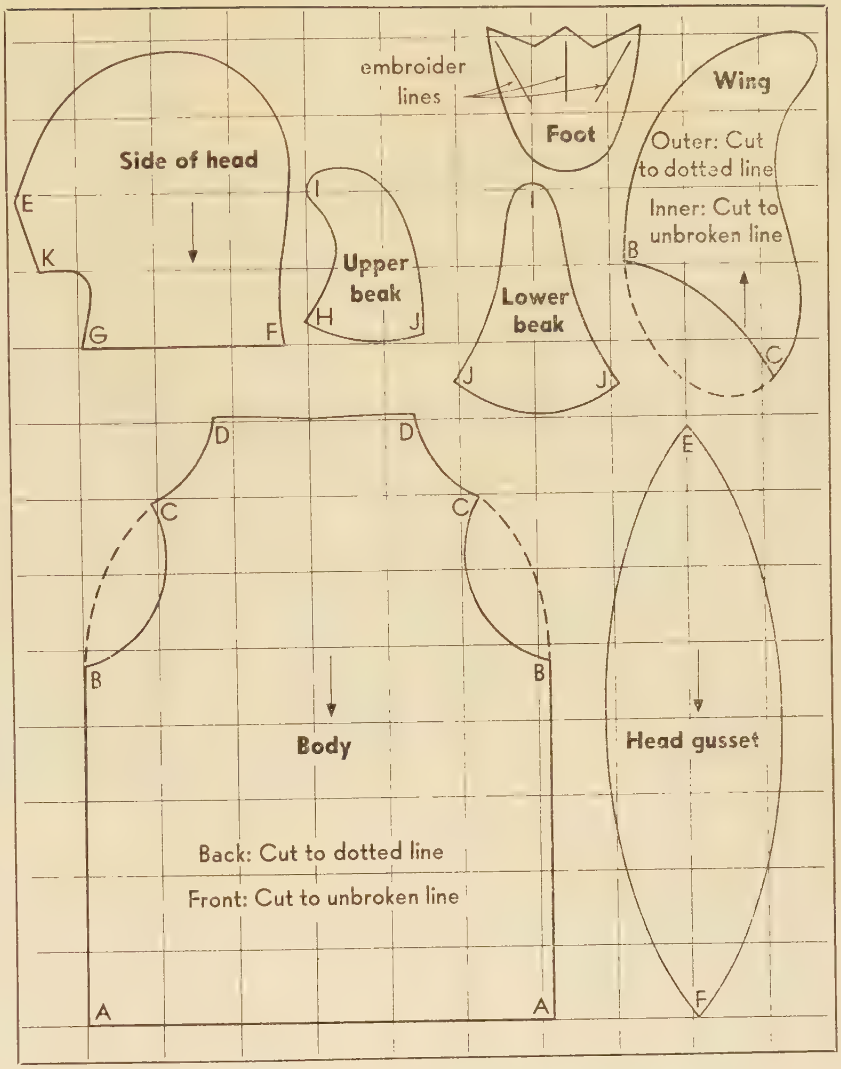
Stuff the beak, packing the stuffing well down to the end. Attach it to the front of the head at the point where the gusset begins. Stitch it in place very firmly as it is sure to be a temptation for childish fingers to try to pull off.

Embroider two black nostrils at the end of the upper beak.

Eyes

For each eye stitch the piece Y (white felt) on top of piece X (black felt) with the rounded edges together. Top with piece Z (black felt), which forms the pupil and which should be placed to give expression. Attach one eye to each side of the head.

DUCK GLOVE PUPPET



Pattern pieces for duck glove puppet. Each square in the graph represents 1 in. To enlarge the pattern to its original size use this scale pattern as a guide and draw it out on paper ruled into 1 in. squares.

Feet

Embroider black lines on the four foot pieces as indicated on the pattern. Stitch two foot pieces together with running stitch to make each foot.

To make the legs take the two 1 in. x 2½ in. pieces of yellow felt and roll each tightly from the narrow end. Catch down the side of each with matching cotton and sew one end to the top of the foot and the other end to the front body piece about 1 in. up from the hem. The legs should be about 2 in. apart.

The feet should stick out almost at right angles from the body.

To Complete the Duck

Go over all the seams on the fur fabric with the eye end of a darning needle, freeing any of the pile which may have been stitched in with the seams so that the duck is smooth all over with no obvious seams. Finish by brushing the pile lightly with a soft brush.

The duck is manipulated by placing the hand inside the body part with fingers and thumb inside the head and wings.

Children learn how to handle it very quickly.

Reference

"Glove Toys" by Margaret Hutchings, Studio "How To Do It" series, No. 75.

Colourful Bib and Traycloth Set

THE colourful, embroidered bib and traycloth, illustrated at right, are easily and quickly worked. The pattern for the transfer and directions for working are given below.

MATERIALS: Two pieces of linen, 12 in. x 14 in. and 13 in. x 18½ in.; ¾ yd of matching bias binding; 1 skein each of stranded cotton in black, white, and yellow; 2 skeins each of stranded cotton in scarlet and jade green.

Tray Cloth

Turn in and tack a hem ¼ in. deep on to right side all round the piece of linen 13 in. x 18½ in. Work a line of zigzag in red over the edge of the hem and single lazy-daisy stitches in jade in the zigzag.

Trace off engine and three carriages so that the lowest point of the line is 4¾ in. from top edge of cloth.

Using three strands throughout embroider as follows:

Line: Black chain stitch. Work a row of jade zigzag stitch just below.

Engine: Wheels red, in radiating buttonhole stitch joined with black line in stem stitch. Outline of front part: Red stem stitch with line of jade stem stitch round front. Curved lines: Jade stem stitch with filling between lines in red zigzag stitch. Lines on chimney: Jade stem stitch. Outline of cab: Jade stem stitch. Window: Jade stem stitch with yellow inside. Top curved line: Red stem stitch, lower line in jade. Stars: Radiating straight stitches in yellow.

First and third carriages: Outline in yellow stem stitch, with line of black under lower edge and line of red under roof. Curved lines: Red stem stitch. Window and door outlines: Jade stem stitch. Window and knob of door: Yellow. Curtains: Yellow satin stitch. Flag pole: Black stem stitch. Flag: Two rows jade chain stitch with red stem stitch between. Stars: Red straight stitches. Wheels: Jade buttonhole stitch.

Couplings: Black stem stitch.

Second carriage: Work as for first, but use red instead of jade and jade instead of red.

Smoke: White stem stitch.

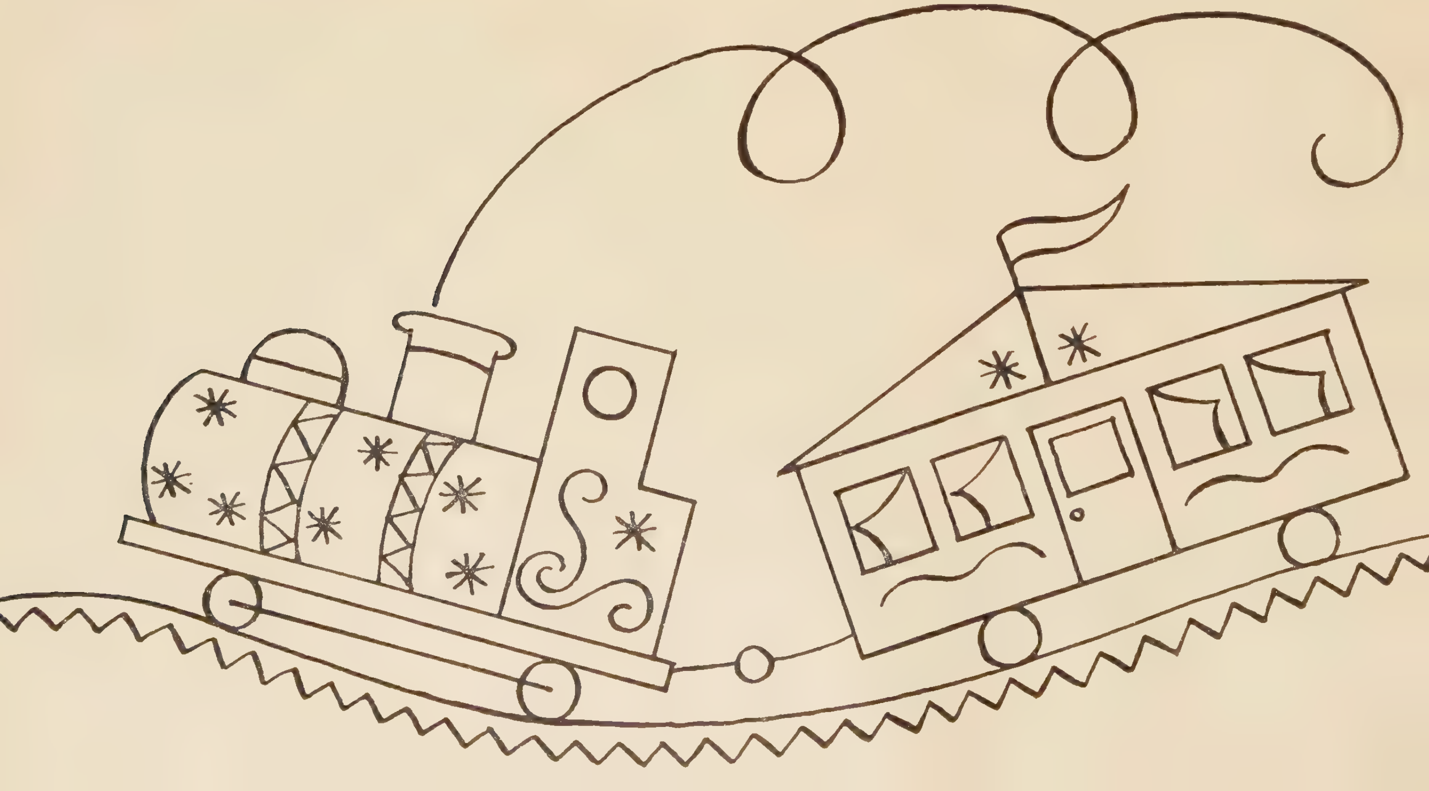
Bib

Cut out curved section for the neck. Turn in the hem all round on to the right side and tack. Bind the neck with centre part of bias binding, leaving about 9 in. at each end. Oversew these neatly to form ties.

Work border as for traycloth.

Trace off engine and one carriage along bottom edge of bib and work to match traycloth.

Press both traycloth and bib over a damp cloth.



Unusual Ways with Bacon

Stuffed baked butterfish covered with strips of bacon and garnished with lemon wedges and parsley makes a delicious change (see recipe on page 296.

BACON is universally known and appreciated as a food which requires little preparation and from which an appetising meal can be prepared in next to no time. Even the most unenthusiastic amateur can, if spurred by the pangs of hunger, make for himself a satisfying meal of bacon and eggs. This article deals briefly with the usual ways of cooking bacon, but is concerned mainly with suggesting a few less stereotyped ways of using it.

By MAUD B. STRAIN,
Home Science Instructor, Department of Agriculture, Dunedin

BACON is the flesh of pigs which have been specially bred for bacon. In the process of manufacture the carcass, split into two sides, is steeped in brine for a time, then matured. At this stage it is known as "green bacon".

After a further process, smoking, which enhances its flavour, improves its keeping qualities, and gives it its appetising appearance, it becomes the bacon with which everyone is familiar.

Originally bacon was hard cured to ensure that it would keep over a long period. However, under modern transport and marketing conditions this is no longer necessary and present demand is largely for mild cured bacon which is not so salty.

When bacon is salty some of the salt can be removed by soaking the bacon in cold water for some hours or overnight. Rashers that have been soaked must be dried before frying; otherwise the moisture will cause spluttering of the fat in the pan.

Mild cured bacon can be stored in a well aired storeroom or larder for 10 to 15 days. It should be hung in a clean flour bag or wrapped in carcass cloth and kept at a temperature of 38 to 40 degrees F.

If bacon is kept in the household refrigerator, it should be wrapped in greaseproof paper and placed on the lowest shelf as far from the freezing box as possible. Saltiness at freezing point induces rancidity, and if the bacon is not wrapped, it will lose its moisture and become dry and hard.

One point often lost sight of when bacon is to be fried is that it is not necessary, nor is it desirable, for extra fat to be put in the frying pan. If rashers are put in a cold, dry frying pan and heated, gently at first, sufficient fat runs from the bacon so that it will not stick to the pan.

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Extra fat makes the cooked bacon more fatty than can be tolerated by some digestions and it is also more difficult to obtain the right degree of crispness. For cooking eggs, etc., to go with the bacon more fat can be added after the bacon has been cooked.

Bacon rashers should have the rind cut off and any small bits of gristle removed before cooking. A pair of kitchen scissors are easier and quicker to use for this than a knife.

Choosing Bacon

When choosing bacon see that the fat is white, not yellow or greenish, and that the rind is smooth, not broken or ruckled.

The lean should be a deep pink, moist, and with no brown stains. The bacon should smell fresh without any hint of rancidity.

Cooking Bacon

When grilling bacon remove the rind and snip the fat at intervals so that the rashers do not curl up.

When several rashers are being grilled together lay them on the griller with fat over lean, but when frying several rashers together lay them in the pan with the lean over fat.

When frying bacon rashers lay them in a cold frying pan. Cook fast for crisp bacon, slowly for soft. Always fry bacon in its own fat only.

When bacon is boiled the water should be kept at simmering point.

Large pieces of bacon can be soaked for a short time to remove some of the salt before they are cooked. Piece bacon requires cooking for 20 minutes per pound plus another 20 minutes for the whole piece.

Bacon rinds can be fried, drained well, and stored in airtight jars and used for garnishes for soups and savoury dishes.

Grilled Bacon

Grilled bacon has the finest cooked flavour. Place rashers on the bars of the grill pan and place the pan 3 to 3½ in. below the heated grill. After 2 to 2½ minutes turn the rashers and cook the other side for a similar time. Bacon cooked this way needs no draining. It should be crisp but not brittle, only slightly curled, and evenly cooked. It needs watching all the time.

Pan-fried Bacon

Place strips in a cold frying pan over moderate heat. Turn the bacon frequently for 6 to 8 minutes until all parts are evenly crisp but not brittle. Pour off the fat as the bacon cooks. Do not allow the fat to smoke or the flavour of the bacon will be affected.

Oven-cooked Bacon

This is an easy method of cooking a quantity of bacon at once. Lay strips with the fat edges overlapping the lean of the next strip on a rack in a shallow pan. Bake on the top shelf of the oven (400 degrees F) for 12 to 15 minutes until the desired crispness is reached. No turning or draining is necessary and the bacon cooks evenly with little curling.

Bacon with Vegetables

Bacon is delicious served with such green vegetables as runner beans, cabbage, and spinach. Simmer a small, unsliced piece of bacon until tender. Add vegetables to the same cooking water and when cooked remove and serve topped with the bacon cut into slices.

Bacon Dripping

Bacon dripping should be carefully saved because it has many uses. One pound of bacon yields from 1 to 1½ cups of appetisingly flavoured fat which can be put to many cooking uses. It can be used as a basis for soups and white sauces; as a flavouring for scalloped dishes, soups, and creamed dishes; for frying eggs, French toast, potatoes, apple slices, and any meats; for "buttering" crumbs used for topping scalloped, au gratin, and casserole dishes; for baking light muffins, coffee cakes, gingerbread, and spice cakes.

About a quarter less bacon dripping is necessary than when other fats are used.

Bacon dripping should be collected in small jars rather than in one larger container where the bottom layer may become stale. The jars should be stored in a refrigerator and the oldest fat used first.

Using Bacon

Fried bacon: Serve as the main ingredient or with fried, scrambled, or poached eggs, omelettes, tomatoes, sliced apples, mushrooms, kidneys, liver, oysters, and savoury fritters.

Bacon strips: Use over meat loaf, lean roasts, baked fish, and poultry. Wrap them round sausages, oysters, and prunes.

Diced bacon bits: Toss into omelettes, green salads, potato croquettes, cream soups, creamed potatoes, vegetables, and casserole dishes.

Cubes of bacon: Cook with baked beans, spinach, and runner beans.

Bacon is without equal as an ingredient of savoury snacks. Its ease of preparation and ability to harmonise with practically everything else in the savoury class, and the fact that only small quantities are necessary, make it ideal for this type of food.

RECIPES

Bacon Pizzas

Squares of bread
Salad dressing
Processed cheese
Tomatoes or tree tomatoes
Bacon

Toast the bread lightly on one side, spread it with salad dressing, and cover with a square of cheese, a slice of tomato, and a square of bacon. Set the savouries on the grill rack, toast them until the bacon is cooked, and serve very hot.

Oysters in Bacon Cases

Oysters, bearded and free of grit
Lemon juice
Cayenne pepper
Rashers of bacon

Sprinkle each oyster with lemon juice and cayenne pepper, then wrap

[*Sparrow*

When bacon rashers are being fried no extra fat should be added.

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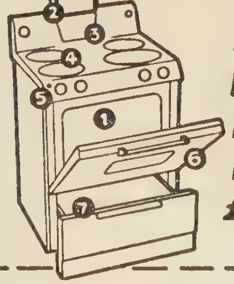

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it in a piece of bacon. Stick several of these on to a metal skewer and rest the skewer across a shallow pan so that the fat drips into the pan. Grill or bake them in the oven just long enough to cook the bacon. Garnish with parsley and serve hot.

Several variations can be used. Smoked fish may be used in place of oysters. Prunes, soaked overnight and pitted, stuffed olives, sweet pickled onions, mushrooms, or dates stuffed with a piece of pineapple, may be used in the same way as the oysters.

Stuffed Roast Bacon

4 lb of loin bacon
½ oz of brown sugar
2 lb of medium sized, peeled potatoes
2 oz of dripping
1 teaspoon of chopped onion
1 tablespoon of flour
1 cup of vegetable stock

Soak the bacon in cold water overnight. Dry it and scrape the surface. Rub the sugar into the under side of the bacon and leave it for a short time to penetrate.

Put the bacon into a pan with enough cold water to cover it and bring it slowly to the boil, skimming when necessary, then put the lid on and simmer the bacon for half the total cooking time (20 minutes per pound plus 20 minutes for the whole piece).

As the roasting time for the bacon will be comparatively short, the potatoes should be started in the roasting pan an hour before the joint. If they are parboiled (put on in cold water, brought to boiling point and boiled for 5 minutes, then drained) before they are roasted, they will brown more readily. Roast them at 400 degrees F and baste frequently.

Stuffing

6 oz of breadcrumbs
3 tablespoons of chopped parsley
4 chopped, soaked prunes
Grated rind of one lemon
¼ teaspoon of salt
Few shakes of pepper
1 egg
Little stock or water

Mix the breadcrumbs, salt, pepper, parsley, lemon rind, and prunes together. Beat the egg and add it to the mixture with just enough stock or water to bind it together. Drain the bacon and remove the outside skin. Lay the stuffing along the inside of the flap part of the meat and roll the whole joint up. Tie the roll up securely with string and put it into the baking tin with the potatoes and roast for the remainder of the time.

About quarter of an hour before the roast is cooked take it out of the oven and prick the surface with a fork. Some of the extra fat will escape and the surface will crisp and brown.

Lift the roast and potatoes on to a hot dish. Pour off the dripping. Use that which remains sticking to the tin to fry the chopped onion. Fry the onion slowly until it is lightly browned. Stir in the flour and let it brown, then add the stock or water and stir the gravy until it boils. Season if necessary. Strain and serve with the roast. A green vegetable should be served with the roast; young, tender broad beans are particularly suitable.

[*Sparrow*

Hot boiled bacon served with an appropriate sauce gives a dish that is pleasingly different. A garnish of green peas and cauliflower would make an attractive colour combination.

Hot Boiled Bacon (with watercress or parsley sauce)

3 lb of shoulder bacon
1 oz of brown sugar
1 chopped onion
1 diced carrot
1 diced turnip
5 peppercorns

Soak the bacon overnight, dry it, and scrape it. Rub the sugar into the surface of the bacon and leave it for a short time. Tie the joint if necessary to keep it compact. Calculate the cooking time. Put the bacon into a saucepan with sufficient cold water to cover it and add the onion, carrot, and turnip. Bring to boiling point and skim the surface. Add the peppercorns, put on the lid, and simmer the bacon for the calculated time.

Sauce

½ pint of the liquid in which the bacon was cooked
½ pint of milk
1½ oz of bacon dripping or butter
1½ oz of flour
2 tablespoons of finely chopped parsley or watercress
Salt and pepper

Strain off half a pint of the liquid from the bacon for the sauce. Melt the bacon dripping in a saucepan, remove from the heat, and stir in the flour. Add the milk and liquid and bring the sauce to boiling point over a low heat, stirring all the time. Stir in the water cress or parsley and seasoning.

Lift the bacon on to a plate, remove the skin, and transfer it to a hot dish. Pour the sauce over it. Garnish with cooked green peas and cooked florets of cauliflower sprinkled with paprika.

Braised Bacon

Piece of shoulder bacon (about 3 lb)
1 oz of brown sugar
1 oz of bacon dripping
2 diced carrots
2 diced turnips
2 diced onions
3 stalks of chopped celery
Pepper
2 teaspoons of flour

Soak the bacon overnight, dry it, and scrape it. Rub the sugar into the lean part of the bacon and let it stand while the vegetables are prepared. Fry the vegetables gently in the dripping for about 10 minutes. Add the pepper to taste and sufficient water to cover the vegetables. Put the bacon on the bed of vegetables, cover with the lid, and bring it to the boil. Cook gently in the oven or on top of the cooker for 1¼ to 1½ hours.

Serve the bacon on a hot dish and arrange the vegetables round it. Blend the flour with a little water, then add it to the liquid in which the bacon was cooked, and stir it until it comes to boiling point. Boil it for a few minutes and pour a little of it over the vegetables.

Bacon and Chicken Pies

8 oz of chopped, lean, cooked bacon
6 oz of chopped, cooked chicken
¾ oz of butter
¾ oz of flour
½ pint of chicken stock
Pepper
¾ lb of pastry
3 small bacon rolls
Beaten egg

Three pies make six servings

Make a white sauce from the butter, flour, and chicken stock. Add the bacon and chicken and a seasoning of pepper. Put the mixture into three pie-dishes and let it cool while making the pastry, from 8 oz of flour, 4 oz of butter, and a little water to mix.

Cover the pies with pastry and flute the edges.

WAYS WITH BACON . . .

Make a hole in the centre of the pastry large enough to accommodate the bacon roll. Place a bacon roll in each hole so that it comes just above the pastry. Brush each pie with beaten egg and stand them in a cold place for half an hour.

Bake the pies in a hot oven (425 degrees F) for 10 minutes then lower the heat to 375 degrees F, and continue baking for another half an hour or until the pastry is golden.

Bacon Circles

4 oz of rice
8 oz of minced, cooked bacon
1 chopped onion
2 tablespoons of chopped parsley
Pepper to taste
1 egg
10 streaky bacon rashers
Dripping for frying

Wash the rice thoroughly to get rid of loose starch and put it into a saucepan of fast-boiling, salted water. When cooked, drain through a colander and pour boiling water through the rice to free the grains. Mix the bacon with the rice, add the onion and the parsley, and season the mixture with pepper. Beat the egg and stir it into the mixture.

Cut the rind off the bacon rashers. Form the rice mixture into about 10 balls and flatten them with the bottom of a tumbler. Encircle each one with a rasher of bacon and secure the ends of the rasher with a cocktail stick.

Heat the dripping in a frying pan and fry the circles three or four minutes on each side. Remove the cocktail sticks before serving.

Bacon Roll

8 oz of cooked or uncooked bacon
4 oz of stewing steak
4 oz of breadcrumbs
1 egg
½ teaspoon of grated nutmeg
⅛ teaspoon of mixed spice
1 teaspoon of Worcestershire sauce
Pepper to taste
Stock

Mince the bacon and stewing steak. Mix the breadcrumbs with the meat and add the nutmeg, mixed spice, Worcestershire sauce, and pepper. Add the beaten egg and enough stock to bind the mixture together. Butter the inside of a straight-sided earthenware 2 lb jar (or other suitable container) and pack the mixture in firmly to avoid air bubbles. Cover the jar with greased greaseproof paper or aluminium foil and steam for two hours.

Turn the roll out of the jar while it is still warm and roll it in breadcrumbs. Serve cold, garnish with sections of tomato and sprigs of parsley.

This is suitable for picnic lunches.

Bacon Paste

6 oz of lean, cooked bacon
3 oz of butter
1 tablespoon of top milk
¼ teaspoon of ground nutmeg
⅛ teaspoon each of ground mace, pepper, and dry mustard

Mince the bacon finely twice. Melt 1 oz of the butter and add it to the bacon with the top milk and the seasoning. Mix the ingredients thoroughly, adding more seasoning if desired, and pack into small earthenware pots. Melt the rest of the butter and cover the surface of the paste with it.

This makes a tasty sandwich filling or savoury for spreading on toast.

Bacon Stuffing

2 oz of breadcrumbs
½ oz of bacon dripping
4 oz of minced, cooked bacon
Pepper to taste
1 tablespoon of chopped parsley
1 egg

Mix the breadcrumbs, dripping, bacon, pepper, and chopped parsley and bind together with the beaten egg.

This stuffing can be used for fish, green and red peppers, etc.

Bacon-banded Stuffed Fish

1 blue cod (about 2 lb)
Or
1 butterfish
6 rashers of streaky bacon
1 tablespoon of bacon dripping
1 lemon

Wash the fish and remove the fins and tail. Dry the fish and fill it with stuffing. Sew up the opening.

Remove the rind from the bacon. Lay pieces of bacon just overlapping each other across the fish to cover it completely, grading the pieces toward the tail.

Heat the dripping in a roasting tin. Put the fish in the tin, cover it with greased paper until it is about half cooked, then remove the paper and let the bacon brown and crisp. Bake in a fairly hot oven (400 degrees F) for about 15 to 20 minutes, then reduce the heat to 350 degrees F for a further 15 to 20 minutes.

Garnish with sections of lemon.

Stuffed Peppers

3 good sized, evenly shaped peppers
1 oz of bacon dripping
Bacon stuffing

Cut off and keep the pointed tops from the peppers and remove the centres and all the seeds. Immerse the peppers and tops in boiling water for 5 to 10 minutes, then take them out and drain them.

Fill the peppers with bacon stuffing and replace the tops. Heat the dripping in a roasting tin, put in the peppers, baste them with the dripping, and bake them in a moderately hot oven (375 degrees F) for half an hour, basting occasionally. Reduce the heat to 350 degrees F for a further 10 minutes or until the peppers are tender. Lift off the tops and brown the filling under a hot grill.

Transporting Flowers; Displays for Hospitals

THE only flowers which will last as well, if not better, without being given any water before transport are chrysanthemums, carnations, gladioli, and tagetes. Bunches of violets or similar small flowers travel well in a polythene bag, which traps a cushion of moist air round the bunch. Larger flowers should be packed carefully in a box lined with greaseproof or other non-absorbent paper in the same way that flowers are sent from growers to florists. They should be packed fairly tightly so that they will not move and damage each other, but too many must not be put in a box, or this will crush the petals.

In an "emergency", roll a bunch of flowers fairly tightly in a thick layer of newspaper, completely enveloping flowers, leaves, and stems.

Covering a bunch of flowers with transparent cellulose wrapping or polythene does a great deal to preserve their life, as it protects them from wind and dry air while they are being carried, so reducing the amount of water lost by transpiration.

The recipient of the flowers should recut the stems and place them in warm water in a cool dark place for a few hours again before arranging them in a vase. Flowers from a florist should be given the same treatment.

Displays for Hospitals

Giving flowers to friends and relatives in hospital is a pleasant custom which all patients appreciate. The pleasure can be prolonged without giving extra work to the busy hospital staff if trouble is taken to prepare the flowers for arrangement before presenting them.

At the very least all leaves which are likely to be under water and other surplus leaves should be removed. It may also be a good idea to arrange the flowers in an attractive bunch beforehand, so that all that is needed on arrival is to place them in fresh water in a clean vase and cut the tie that holds them in place. This will not produce a floral masterpiece, but it will give a pleasing effect with the least trouble to the staff.

Flowers with a heavy scent or much pollen should never be included.

—JOY WATKINS, Instructor in Horticulture,
Department of Agriculture, Auckland

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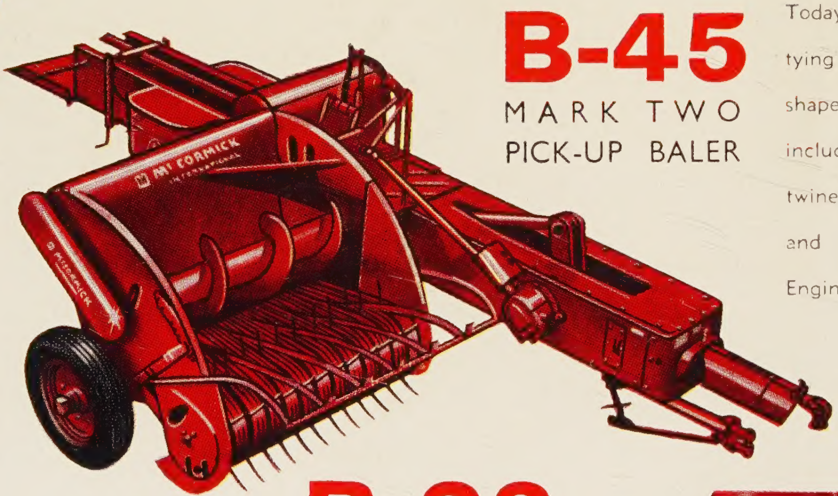

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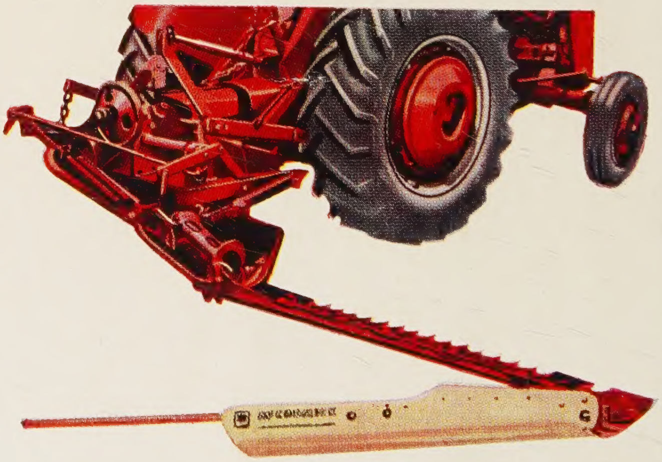

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